EY
Building a better working world

Central New York REDC

Phase II Regional Sector-Based Strategies

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Economic Development Advisory Services
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Executive Summary

Recent investments demonstrate the State of New York's commitment to growing a strong and durable workforce for the future economy. Via the newly created Office of Strategic Workforce Development (OSWD), Empire State Development (ESD) and the Regional Economic Development Councils (REDCs) have identified the industry sectors that have the most potential for growing inclusive, robust economies in each region and throughout the state. Accomplishing this goal requires renewed collaboration between stakeholders in each region, and comprehensive assessments of existing and potential capacities in the workforce development ecosystem. A specific focus of this effort is the necessary strategies and partnerships that can have the most impact on increasing labor force participation, especially among underserved populations across the state.

Over the course of the project, the EY team, in partnership with Stragility, LLC. (a NYS Certified WBE), worked closely with the Central New York REDC (CNY REDC) to establish sector priorities and develop strategic considerations that support and augment existing strategies and have the most promising impact on economic growth and opportunity for the local workforce and industry. During the research and stakeholder engagement process, our team discovered several common themes across the regions and state. These themes formed the basis for strategy development and are expanded on further in the report. They include:

- Strategies for **driving long-term competitiveness and sustainable talent pipelines in the targeted sectors require intensive collaboration** at the state, regional, and local levels. Some effective coalitions exist, and continued efforts in data sharing and developments of regional strategies can prevent duplication of efforts when building effective workforce strategies.
- Significant work remains in raising awareness of careers in the tradeable sectors. **Articulating the potential wages and funded training is important in reaching the most vulnerable populations** and will serve to counter misperceptions about technical careers.
- **Labor force participation has negatively impacted incumbent labor pools, and training initiatives alone are not the solution.** Special considerations are important to reach the underserved, and to compel those not seeking employment today to return to the workforce.
- There is inconsistency in the **supply of educational programming, K-12 to industry pathways, and job placement consortiums** that create opportunity and contribute to successful talent acquisition and retention in the targeted sectors.
- Employer engagement in the d**evelopment of new training, identification of essential skills and adoption of direct placement programs** is essential in the workforce development pipeline.

The Central New York REDC has shown a tireless commitment to the development of the region's workforce and industry. Recent developments in Central New York, including the announcement of a major mega-fab project, demonstrate the region's appeal to industry and the potential to develop innovative public-private partnerships. Subsequent announcements in funding initiatives, community collaboratives, and transportation projects promise to shape the economic future of the region for years to come. The regions educational, community, and innovation assets are mobilized, and a continued focus on collaboration and partnerships will build a dynamic, inclusive workforce that supports innovation and equity.

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Disclaimer

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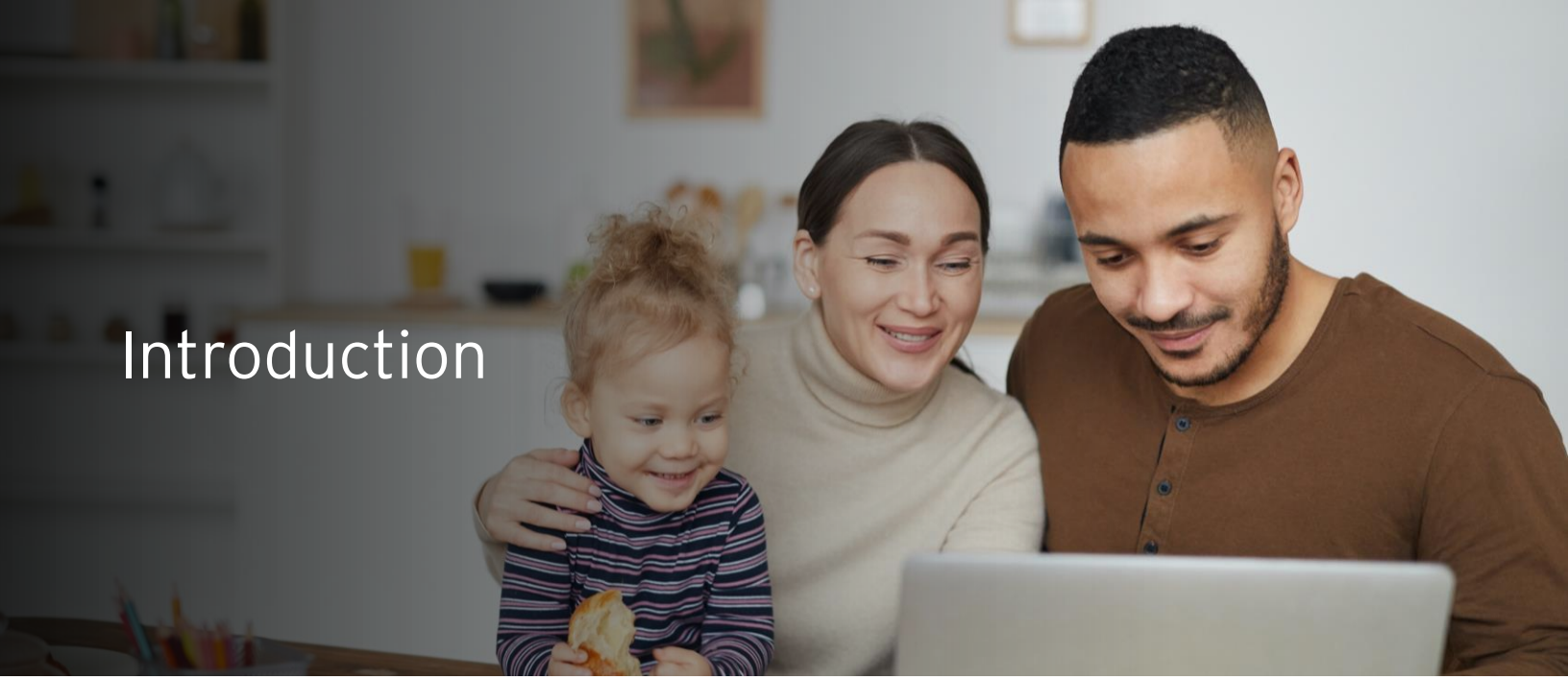


Introduction

Background information

In the spring of 2022, New York Governor Kathy Hochul launched the Office of Strategic Workforce Development (OSWD) with a $350 million investment to align regional workforce development efforts with the needs of employers in New York, particularly for those in growing sectors. Under the direction of the Empire State Development (ESD), OSWD is charged with coordinating with agency partners, employers, institutions of higher education, and regional stakeholders to achieve the following goals:

- Expanding access to training and placement support for underserved communities that have traditionally faced barriers to employment
- Ensuring New York's workforce is equipped with skills to meet the needs of businesses in high-growth, tradeable sectors across the state
- Creating pathways for unemployed and underemployed New Yorkers to access good jobs that provide economic security and opportunities for career growth
- Sustaining talent pipelines for essential industries experiencing growing needs and high attrition rates, such as health care, education, and civil service

In 2021, New York State's (NYS) 10 Regional Economic Development Councils (REDCs) were tasked to develop a Regional Workforce Inventory (Inventory or Phase I) that identified the following:

- Each REDC's priority tradeable sectors
- The most in-demand skill sets needed by employers
- Populations for whom workforce training is most needed
- Wraparound services needed to lower workforce entry barriers

In addition to benchmarking each region's post-pandemic workforce needs, Phase I laid the groundwork for the optimizing multi-year funding, which includes $150 million in grant programs designed to support employer-driven, high-skilled workforce training programs.

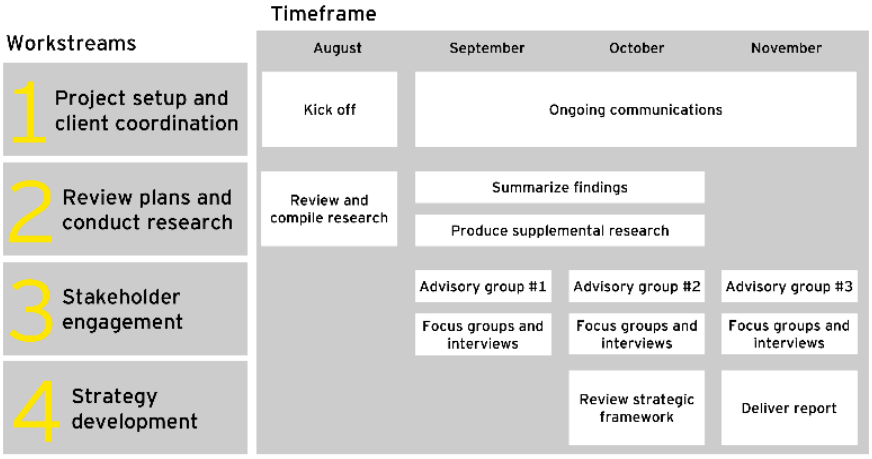
Phase II objective

In August 2022, ESD retained Ernst & Young LLP (EY) to aid the CNY REDC with validating and building upon the work completed in Phase I and aligning the CNY REDC's work with ESD's goals, objectives, and statewide strategy for economic development.

In Phase II, EY, in partnership with Stragility, LLC. (a NYS Certified WBE) was tasked with developing sector-specific workforce strategies that provide a roadmap for how to address the workforce issues identified for CNY REDC's targeted tradeable sectors. More broadly, the strategies seek to promote the overall economic health of the region, increase the resiliency and size of the labor market for employers, and serve the underserved and underrepresented populations. In addition to benchmarking each region's post-pandemic workforce needs, Phase I laid the groundwork for the optimizing multi-year funding, which includes $150 million in grant programs designed to support employer-driven, high-skilled workforce training programs.

Process

The process for Phase II included four workstreams occurring over three months. Those workstreams are illustrated below.



Over the course of the engagement, EY maintained ongoing communication with CNY REDC and ESD to provide status updates, plan meetings, and track progress.

Industry selection

When considering the industry sectors to prioritize in a workforce development strategy, EY and CNY REDC evaluated how CNY's inventory of established tradeable sectors performs against the following criteria:

- Opportunities to extend findings from Phase I into considerations for implementation
- Alignment with ESD's statewide target industry sectors
- Best use of CNY's current and planned future assets and tools
- Support for CNY's goals and values
- Regional labor force and employer needs
- Minimal barriers to entry for unemployed, underemployed, and underserved
- Recurring trends of in-demand skills
- Projected job growth (positions and wages) in the sector

Industry selection (continued)

Of the four tradeable sectors identified in Phase I, CNY REDC and its advisory committee agreed to focus their regional strategies in support of the Advanced Manufacturing and Smart Systems Cluster sectors. The North American Industrial Classification System (NAICS) codes associated with these sectors were defined by the New York Department of Labor and provided to the EY team by ESD. These will be included in the data appendix to the final report.

Both Advanced Manufacturing and Smart Systems Cluster operate regional employment pipelines that have the potential to bridge high-wage occupations with current and future job seekers that may be unemployed, underemployed, and underserved. The diverse array of goods manufactured and assembled in CNY is consumed on a global scale, which bodes well for the industry sectors' resilience.

Background review

To begin the project, EY conducted a background review of documents provided by CNY REDC to better understand the workforce and target sectors of the CNY region, as well as recent economic development priorities and achievements for the region and the REDC. The following is a non-exhaustive list of materials provided to and reviewed by EY:

- Central New York Region Plan (2017-2020)
- Significant Industries, Department of Labor (2021)
- CNY Business Workforce Survey Results (2022)
- County-level Jobs Trends, Department of Labor (2022)
- Labor Market Briefing, Department of Labor (2022)
- Expansions, Contractions and Labor Disputes, Department of Labor (2022)
- Central New York Progress Report, Phase I (2022)
- REDC Phase II Guidance, New York State ESD/OSWD (2022)
- Centerstate CEO BBBRC Phase II Application (2022)

Supplemental data analysis

While the Phase 1 inventory provides a sound foundation for direction, further quantitative research was needed to validate those findings and the findings from the surveys conducted in partnership between New York State and the Business Council of New York State.

The following were suggested for supplemental research and are provided as an appendix to the final report:

- Regional workforce conditions
- Industry analysis on the two target sectors: Advanced Manufacturing and the Smart Systems Cluster
- Occupational analysis of the two target sectors
- Educational programming that supports overall workforce development and the programming specific to the two target sectors

Stakeholder engagement

To supplement the analysis and findings from Phase I and Phase II, EY collaborated with CNY REDC and its advisory committee to identify employers, industry associations, training providers, community-based organizations, wraparound service providers, educational institutions, labor unions and other relevant stakeholders across the Advanced Manufacturing and Smart Systems Cluster industry sectors. These groups were invited to participate in focus groups and interviews during October.

Focus group and interview list

Industry	Civic/non-profit	Interviews
Smart Systems (2)	CNY EDOs and IDAs	New American and Latinx community advocates
Advanced Manufacturing (2)	Higher and public education partners	Higher education ecosystem Partner
Workforce training partners	New American	**City of Syracuse government**

Advanced Manufacturing

A workforce development strategy for the Advanced Manufacturing industry in Central New York

1 Advanced Manufacturing: Research findings

Industry overview

The CNY REDC and EY selected Advanced Manufacturing as one of the two sectors to receive a workforce strategy based on its potential for unemployed, underemployed, and underserved jobseekers, as well as its ability to promote resiliency in the regional economy.

The Advanced Manufacturing sector in Central New York has a rooted history within the region and is vital to the growth and prosperity of the economy. Currently, the sector employs over 15,000 workers and will employ more in the coming years as a result of the announcement of a prominent mega-fab site location.

While there has been a moderate decline in the number of Advanced Manufacturing employers in recent years, most observers believe that trend will reverse with the mega-fab announcement. Yet, a majority of the workforce is aging, white and male -- indicating that outreach to incumbent talent will be among the most important tasks to increase labor force participation.

A low barrier of entry to the workforce, potential high wages, and a low job turnover rate position Advanced Manufacturing as a key tradeable sector for the region to invest in. While there are improvements that can be made to the overall Advanced Manufacturing ecosystem in CNY, a sustainable pipeline development is attainable with a diverse array of awareness, outreach, training, collaboration and support services for both talent and industry.

Regional workforce analysis

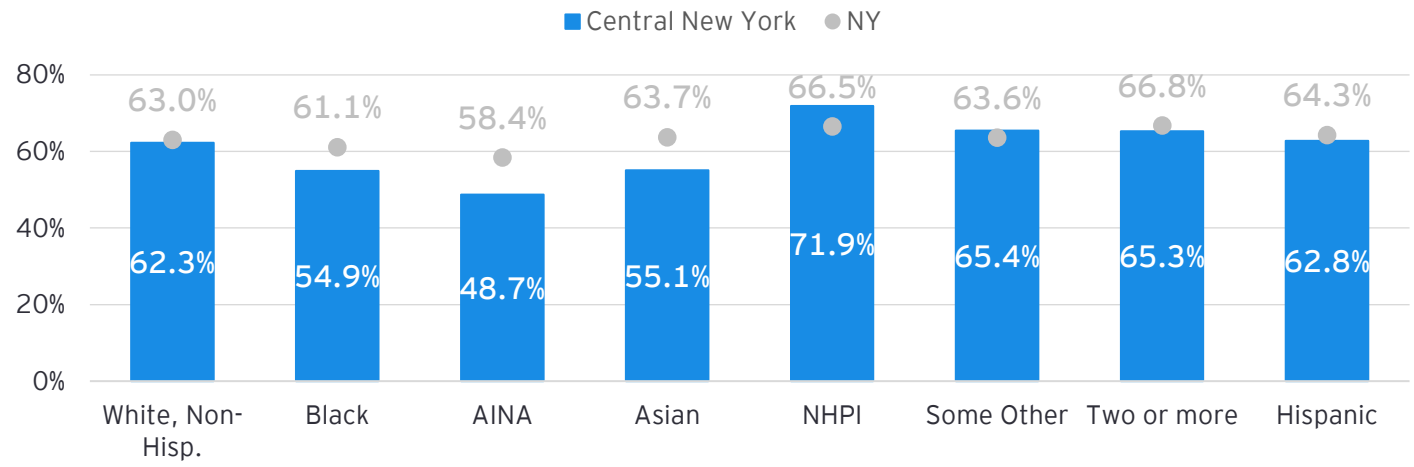
The socioeconomic and demographic trends in CNY present several areas that are primed for opportunity. Population trends by year, age, and race/ethnicity can provide insight on the region's ability to supply the labor needed to support CNY's economy. Having a solid understanding of where the region currently stands provides a benchmark for future goals.

Unemployment and labor force participation

- The unemployment rate in the region has recovered to pre-pandemic levels; however, the size of the labor force remains slightly below pre-pandemic levels.
- Unemployment rates decline with higher education level and are lower than state averages for workers with some college or higher; lower-educated workers in the region, especially those with a high school education or less, are more likely to be unemployed compared with the state average.
- Black and Asian populations in Central New York have much higher unemployment than their peers across the state. Minority unemployment is much higher than white unemployment.
- The labor participation rate is lower in Central New York than the state average with mixed labor participation force rates by race and ethnicity compared with the state; labor force participation by age is on par with state averages.
- The labor force (those working or looking for work) in CNY is larger than pre-pandemic levels, and the labor participation rate is higher in CNY than the state average; still, employment in the region has yet to fully rebound to pre-pandemic levels.
- Labor participation rates in CNY are highest for people in their prime working age (25 to 54 years old). Still, older residents have higher participation rates than the state average.
- Labor participation rates by race and ethnicity are mixed. White and Hispanic participation is on par with the state average, while Black and Asian labor participation is relatively low.

The region has an opportunity to increase minority participation in the workforce

Labor force participation rate by race/ethnicity, 2020



Source:
US Census Bureau

Population trends

- The population in Central New York has been steadily declining over the past decade, but a slight uptick occurred post-pandemic. Population growth has been attributed to growth in Onondaga County and by minority populations. Still, the region is predominantly white and has smaller minority populations and relatively few foreign-born residents.
- Central New York has a higher share of young adults (15 to 24) but is under-represented by young professionals (25 to 44). The population of CNY is getting older with growth concentrated in those 65 or older. Poverty levels are comparable to the state average; however, the region has a higher percentage of the population with a disability compared with the state.

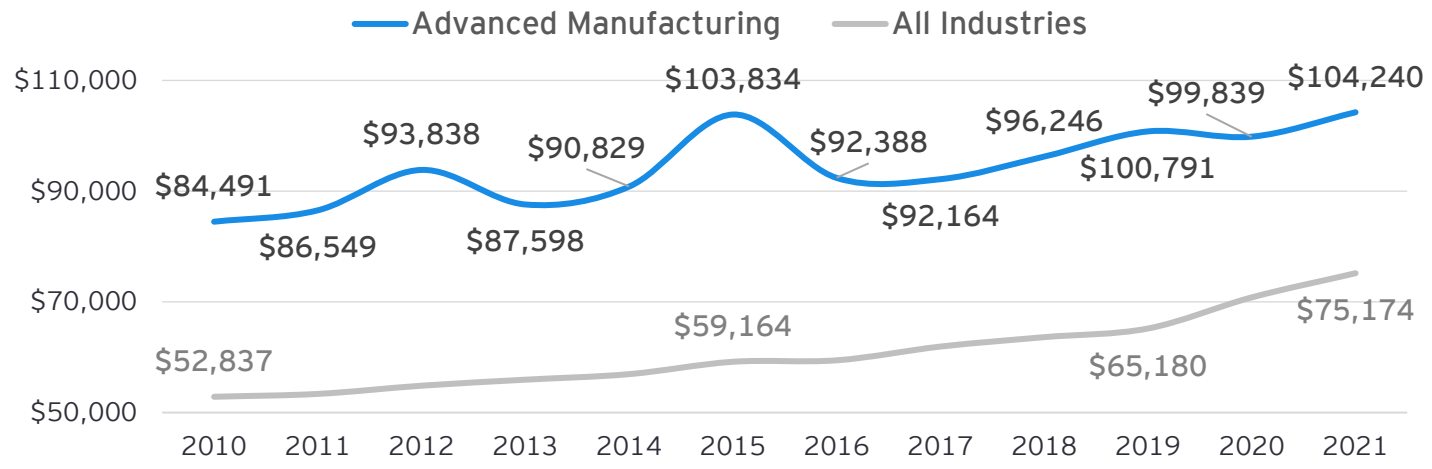
Industry analysis

Examining the overall trends facing the Advanced Manufacturing industry sheds light on the region's competitiveness to recruit, expand, and retain high-impact businesses that invest in the tax base. Equally important, these enterprises present an opportunity to offer high-quality, in-demand jobs for Central New York's unemployed, underserved, and underrepresented populations.

- Advanced Manufacturing employment has experienced cycles of growth and decline over the last 10 years in Central New York and now employs over 15,000 workers. Instruments and Medical Equipment are the largest subsectors, followed by General Machinery, Communications Equipment, and Semiconductors.
- Central New York is home to over 200 Advanced Manufacturers, with some decline in recent years.
- Worker median earnings in Central New York Advanced Manufacturing are more than $104,000 and are 30% higher than average of all industries.
- Two-thirds of all Advanced Manufacturing jobs in Central New York require a high school diploma or less.
- Males and older workers account for a much larger share of employment (69%) than seen for all industries.
- Older workers (45 and older) comprise a much higher share of the Advanced Manufacturing workforce in Central New York, which will result in more retirements in coming years.

Earnings in Advanced Manufacturing are significantly higher than the regional average

Average annual earnings, 2010 – 2021



Source:
US Census Bureau

Occupational analysis

Talent development requires coordination among employers, educators, and training facilities. Maintaining a system-wide understanding of staffing patters, typical entry-level education, and potential earnings helps to preserve a talent pipeline that's responsive to the needs of employers and job seekers.

- A large number of Central New York workers in Advanced Manufacturing are in electrical assembly, miscellaneous assembly, and inspectors and testers.
- For high school graduate positions, most jobs in Advanced Manufacturing are in electrical and miscellaneous assembly, inspection and testing, and supervision of workers. The median hourly earnings for the top 25 of these entry-level positions is $20.90.
- For some college, certificate, or associate positions, most jobs in Advanced Manufacturing are for drivers, accounting clerks, and industrial technicians.
- For bachelor's positions, most jobs in Advanced Manufacturing are for industrial engineers, managers, software developers, and mechanical/electrical engineers.

Educational programming

A region's ability to produce talent across the entire labor spectrum is closely linked to its ability to sustain economic growth. Analyzing the output from CNY's educational programming provides insights on labor shortages, misalignment with employer needs, and clarity into workforce development investments.

General

- The population in Central New York tends to have lower educational attainment compared with the state averages, with 31% of adults (25 years old or older) having a bachelor's degree or higher (compared with 37% for the state). The share of adults with that level of educational attainment has increased over time.
- Over 80% of all postsecondary credentials produced in Central New York are at the bachelor's level or higher.
- Business programs produce the most graduates, followed by Health and Education. Health professions offer the most diverse degree award options. Large numbers of IT Master's are produced (650).
- Accredited certificate degrees from 12 weeks but less than one-year are the most produced within the region. Relatively few shorter-term certificates are produced.
- Registered apprentices have more than tripled in Central New York since 2016, and programs accepted more than 1,600 new students in 2021.
- Electrician programs receive the majority of new apprentices each year followed by millwrights and industrial machinery mechanics.
- Computer science Master's graduates increased the most over the last five years, followed by Business Master's and Health (at all levels). Liberal Arts Associate's and Engineering Master's fell the most (possibly due to a reclassification into IT).

Educational programming

Industry-specific

- Advanced Manufacturing firms, as shown in tables in the previous pages, require diverse occupations to fill jobs in their facilities. The gap analysis below shows that Central New York underproduces Certificate-level graduates in Advanced Manufacturing and may underproduce at higher education levels if graduates choose not to stay in the region.
- The table below shows occupation groups that are matched to degree programs to determine if the supply of graduates is sufficient to meet demand (measured as job openings in a year). A US comparison helps clarify if there is a gap or overproduction of graduates by comparing regional graduates to jobs with the US ratio of graduates to jobs (as shown in the right column below).
- Certificate-level positions are significantly underserved by local accredited education programs. Machinists are under-produced with just 2 graduates. Industrial Production Technicians and Industrial Machinery Maintenance have no graduates to serve the 300+ annual job openings. Welding graduates are underproduced. On a positive note, Electronic Repair graduates are in-balance with demand relative to US levels.

Supply-Demand Gap Conditions
Advanced Manufacturing, Central New York

Gap	Occupation Group	Avg. Educ. Level	Regional 2021 Job Openings	Graduates	Regional Ratio	Supply-demand Ratio versus US
	Electrical & Electronics Repairers	Certificate	82	32	39%	90%
	General Machinist	Certificate	164	2	1%	11%
	Industrial Production Technicians	Certificate	147	0	0%	0%
	Industrial Machinery Maintenance	Certificate	131	0	0%	0%
	Welders	Certificate	77	35	45%	58%
	Chemical Technicians	Associate's	20	0	0%	0%
	Electrical / Electronics Technicians & Di	Associate's	43	34	79%	293%
	Industrial Engineering Technicians	Associate's	32	20	63%	66%
	Accountants & Tax Examiners	Bachelor's	256	321	125%	259%
	Operations Research Analysts	Bachelor's	10	0	0%	0%
	Electrical and Electronics Engineers	Bachelor's	65	70	108%	86%
	Engineering Managers	Bachelor's	35	0	0%	0%
	Industrial Engineers	Bachelor's	76	25	33%	45%
	Mechanical Engineers	Bachelor's	79	109	138%	81%
	Computer Systems & Information Secu	Bachelor's	130	724	557%	614%
	Supply Chain Managers & Analysts	Bachelor's	28	59	211%	549%

Lg Shortage | Shortage | In-Balance | Over-Supply | Lg Over-Supply

Source:
EY analysis of data from Lightcast and US Dept. of Education

Ecosystem observations

An initial framework was developed after reviewing data and information from Phase I to help assess the strengths, challenges, and opportunities within the CNY's regional Advanced Manufacturing workforce development ecosystem. This framework focused on the areas of 1) industry-informed training, 2) awareness of opportunities, and 3) wraparound services and support.

The following illustration outlines the types of work within each of those focus areas:

Industry-informed training

Utilizing relationships between employers and talent pipelines is a central component of OSWD's approach to workforce development. Alignment of industry needs with career readiness, job training, and upskilling activities may expand career pathways for all segments of the labor force.

- The region is home to several training centers that offer manufacturing-related degree and non-degree certifications, including the Manufacturers Intermediary Apprenticeship Program (MIAP); the Manufacturing Association of Central New York (MACNY); Train, Develop, Organize (TDO); SUNY Oswego; Onondaga Community College (OCC); and the four local BOCES, to name a few.
- Select manufacturers are engaged in developing industry-informed training with local education institutions and workforce partners. In other cases, they have limited available resources to dedicate to engaging with educators.
- Overall, employer engagement in the development of region-wide training and curriculum is limited.

Awareness of opportunities

Innovation within the Advanced Manufacturing industry has grown, resulting in a wide range of career opportunities. Clear definition of stakeholder roles, target audiences, and methods of promotion may increase awareness and participation within the target sectors.

- While training programs and organizations exist within the region, the limited awareness of opportunities for untapped talent and unrealized potential partnerships between organizations may inhibit production of talent to meet labor demand.
- Government and private/non-profit organizations are providing workforce development funding and assistance, especially in select sectors and for target populations, but alignment of programs could be improved, along with a reduction in the levels of bureaucracy associated with some programs.

Awareness of opportunities (continued)

- While K-12 engagement exists within the region, coordinated campaigns and sample curriculum at various stages of K-12 pipeline may boost engagement more effectively.
- There is a generational gap of understanding between employers and younger, new talent. What drives younger generations is not fully aligned with what attracted older generations to the industry.
- Events like Manufacturing Day and career open houses seek to raise awareness for opportunities in the sector, but efforts could be more frequent, coordinated, and tailored to the job seeker. In general, job seekers may not be fully aware and informed of the career opportunities offered by Advanced Manufacturing.

Wraparound services and support

Socioeconomic barriers may hamper target populations' ability to retain a job in a regional tradeable sector, complete a career-advancement program, or participate in the labor force. Addressing these impediments through services and programs may unlock opportunities for hidden talent for the Advanced Manufacturing industry sector.

- Limited childcare spots for new children, high cost for parents, and low wages for caretakers may make it more difficult for some residents with children to enter the labor force.
- Central New York is a car-reliant region, requiring job seekers to have access to reliable, affordable transportation. Only 19.8% of jobs in the Syracuse MSA are located within a 30-minute commute, and jobs often are not on bus lines or don't have schedules that align with bus services.
- Veterans often have unique skills and the necessary career readiness to enter the workforce yet often require employers that are informed about their needs.
- There are often legal and logistic barriers (e.g., obtaining a driver's license, stable housing and food) that may prevent viable candidates from participating in the workforce.
- Potential job seekers that have been out of the workforce sometimes require coaching to prepare for a job and mentoring once employed.
- For residents whose primary language is not English, traditional workforce barriers are compounded by language barriers. This is especially true for the New American population that resides in the region that is also often navigating cultural barriers.
- Limited wraparound support services often inhibits untapped incumbent talent from workforce and/or training entry, and both job seekers and employers may struggle to navigate the available resources.
- There is a high concentration of small to medium manufacturers in the region that may not have the resources or capacity to pursue programs to upskill their labor force or onboard talent from non-traditional sources.

Heartland Regional Transportation Planning Organization
Ensuring the availability of efficient, cost-effective, and quality transportation services for transportation disadvantaged persons. The Transportation Disadvantaged Program is a coordinated system in all 67 Florida counties that provides vital transportation to medical appointments, employment, educational and other life sustaining services for those who cannot obtain their own transportation due to a disability, age, or income for an affordable co-pay.

2 Advanced Manufacturing: Strategy framework

Industry overview

With the insights gathered through the background review and stakeholder engagement process, the following strategic framework was developed as the foundation of a sector-based workforce development plan.

The strategic framework comprises four goals, each with considerations that clarify the direction Advanced Manufacturing leaders could pursue to achieve the goal. Within each goal, an assessment of activities identifies areas that are primed for change. Opportunities are presented as potential solutions, which may be taken to address stated challenges and realize the goal.

Goals

1. Increased awareness and engagement for careers in Advanced Manufacturing
2. Increased training and wraparound services for underserved populations
3. Effective ecosystem collaboration to map and scale employer support services
4. Sustainable talent acquisition and retention by promoting direct hire, earn-and-learn, apprenticeship and short-term training consortiums

Target populations

- Asset-Limited, Income Constrained, Employed (ALICE)
- Individuals outside of the workforce
- Talent outside of college bound students
- Graduates from local colleges and universities
- Incumbent workforce

Goal 1: Increase awareness and engagement for manufacturing careers

In Central New York and other regions, stakeholders consistently report limited of awareness and misperceptions surrounding career opportunities in Advanced Manufacturing. This concern is present across most industry sectors, and addressing it is a critical component of developing a workforce pipeline. It was also noted as a shared concern across all four regions served by EY during this project and is recognized as a nationwide issue as well. Its prominence across the regions, sectors, and employers suggests that it not only be a top priority for Central New York, but for the state as a well.

In Central New York specifically, this goal has particular importance as it relates to the age and availability of the workforce. Over the past 12 years, population in the Central New York MSA has moderately declined, but minority populations have increased twice as fast as others. This highlights the importance of awareness of these careers, and specific strategies to address awareness have the potential of impacting the most vulnerable populations. The workers include communities of color, particular in the New American population; the underserved; ALICE (asset-limited, income-constrained, employed) workers; talent outside of college-bound students; and individuals outside of the workforce.

The need for greater awareness of career and growth opportunities within Advanced Manufacturing is primarily focused on the K-12 talent pipeline but extends further to those seeking to re-enter the workforce or considering a career change. Local school districts and higher education, in collaboration with industry, are working to build Science, Technology, Engineering, Arts, and Mathematics (STEAM) programming that will serve to close the gap. Manufacturing associations and organizations like the Manufacturing Association of Central New York (MACNY) are working to educate community leaders and others to ensure awareness.

Here are some considerations when focused on the K-12 pipeline:

- Awareness and exposure can start at an early age with the level of employer engagement increasing over time as the students reach junior high school.
- Curriculum and activities should be focused on the applied aspect of the technical discipline, making the connection with hands-on experience to industry and technical careers.
- Comprehensive information about career opportunities related to Advanced Manufacturing industry sector given to school administrators, teachers and career counselors could jump-start students' awareness and access to valuable training and opportunities.
- Information on career opportunities and pipelines in Advanced Manufacturing should be readily accessible to parents, as they often play an important role in guiding their child's future career and educational decisions.

For all audiences:

- Compelling content partnered with local industry can provide consistent, actionable information for students and potential job seekers to enter the workforce.
- Having a central repository of consistent, up-to-date information of skills, resources, and networks in the industry can lower the barrier for residents and allow them to explore their potential role and career in the future workforce.
- Misperceptions will need to be addressed head on. Communicating the realities of the work, work environment, available resources and networks, and the skills necessary to do the job may improve people's perspectives of the industry and their future within it.
- Peer experience is viewed as an effective method for helping both students and potential job seekers see themselves in an opportunity. Ambassador-type programs have been popular for the last several decades and with social media, have the potential for an even greater reach.
- Career opportunities paired with a "live, work, and play" community framework can impact a region's appeal, driving talent attraction and retention.

Assessment of career awareness in Advanced Manufacturing

Awareness of Advanced Manufacturing careers was one of the key aspects of the workforce ecosystem explored during our research on the region and in conversations with regional stakeholders.

Our main takeaways from stakeholder engagement and research were:

- Employers have an essential role in career opportunity awareness and talent attraction. Their presence and engagement in the community, participation in career awareness events and support of employees engaging in ambassador programs are pivotal in creating more excitement for local career opportunities. In designing their engagement, they will need to be cognizant of generational and cultural differences to capture potential talent from incumbent, untapped talent. Developing and marketing programs that directly hire training participants or allow for earn-and-learn opportunities can further incentivize incumbent talent to pursue Advanced Manufacturing.
- The career awareness initiatives and resources available by school district vary by community. A shared industry-informed plan for career awareness and employer engagement could benefit schools with less resources and promote consistency throughout the region. In some instances, resources or equipment could be shared across numerous districts or a regional educational foundation (e.g., BOCES). This approach can be particularly effective when paired with site visits for students in the manufacturing sector, creating tangible experiences for those who are not university-bound.
- Regional assets and outreach programming in higher education make significant impacts in the community. ERIE 21 at LeMoyne, CASE at Syracuse, and SUNY Oswego's Innovation Challenge are all sound examples of institutions of higher education working to bridge the gap between students, workers, and industry partners. Enhancing these programs and collaborating on similar efforts will be beneficial for coordinated and holistic pipeline development.
- Reaching and engaging the target populations will likely necessitate a well-resourced multi-media campaign and interactive platform for promoting careers and educational opportunities in the target sectors. An initiative of this size could be led at the state level with ties to regional resources and opportunities.
- Negative perceptions of Advanced Manufacturing still abound. Increased education to parents, teachers, counselors, influencers, community leaders, and others is important. In addition, industry collaboration, via peer or ambassador programs, tours, marketing collateral, promotion, events, and other activities can help to counter misperceptions of Advanced Manufacturing careers, resulting in greater interest and engagement.
- In addition to any statewide resources, there are resources and initiatives sponsored by national manufacturing associations for promoting careers in their sector. These often include networks, events and competitions, sample activities and curriculum suggestions, and toolkits for promoting the sector. For example, MACNY's partnership with Tooling U to offer a Certified Manufacturing Associate certification is a self-paced curriculum designed to provide the skills necessary for entry-level employment in Advanced Manufacturing. The region should leverage these publicly available resources when possible.

Goal 1: Potential opportunities and partners

The following are opportunities that Central New York could explore to increase awareness and excitement for career opportunities in its targeted sectors.

- **Development of a regional campaign promoting Advanced Manufacturing careers.**

  These campaigns could include testimonials from peers, videos showcasing companies and occupations, and virtual reality experiences, to name a few. Content should be optimized for various media channels and sharing platforms. Ideally, this content could be developed at the state level, focusing on the economic mobility of identified industry sectors, followed by regional campaigns supporting specific industry sectors. The goal of a campaign would be to dispel myths, create momentum, and generate interest in manufacturing careers.

  Potential partners: Empire State Development, New York Department of Labor, major industry associations and employers, Central New York REDC, and local higher education

- **Launching of an interactive website and/or app to showcase pathways, opportunities, and resources.**

  A multimedia campaign could direct students, parents, and potential job seekers to a landing page to further explore statewide or regional information on sector opportunities. Employers, wraparound services providers, and other workforce/ecosystem participants could participate, resulting in a centralized location where job seekers, employers, training entities, and service providers can easily find services, content, and opportunities in the area. Some stakeholders envision a mobile app, styled after social media platforms, that allows users to quickly find training programs, services, and open positions based on their unique profiles.

  Potential partners: Empire State Development, New York Department of Labor, major industry associations and employers, Central New York REDC, local higher education, local wraparound service providers, and staffing organizations

South Carolina Future Makers
The South Carolina Manufacturers Alliance launched a public-private partnership to increase engagement between the state's manufacturing companies, technology communities and students in middle school, high school, technical college and four-year college, plus their parents. The initiative showcases the many paths and opportunity within manufacturing.

- **Coordinated initiatives and immersive collaboration between schools, industry, and local training centers focusing on STEAM programming, K-12 industry engagement.**

  A regional plan for employer engagement and career awareness initiatives for the K-12 pipeline could also include a plan for job shadowing, pre-apprenticeship programming, and resource sharing. Designed in partnership with industry, this plan could coordinate and build upon STEAM education curriculum, STEAM competitions, and career awareness and exposure events at an early age. Middle school, junior high, and high school initiatives could occur in individual schools, at a broader community level, or regionally. The audience would include administrators, career counselors, parents and students. In some instances, new programs could be piloted in one district or school then scaled accordingly. The new STEAM school in Syracuse could be used as a model for future centers. Example programming in similar models includes Advanced Manufacturing (Industry 4.0), applied robotics, mechatronics, cyber security, and full stack web development/coding.

  Potential partners: New York Department of Labor, New York State Education Department, New York State School Boards Association, school districts, BOCES, major industry associations, employers, and CNY REDC

Goal 1: Potential opportunities and partners (continued)

- **Establishment of dual-enrollment, job shadowing, pre-apprenticeship programming.**

  Scaling dual-enrollment programs in technical disciplines can create accelerated pathways for high school graduates who are not university-bound. Coupled with job shadowing, co-op, experiential learning, and pre-apprenticeships, this approach can make an immediate talent impact on underserved populations and employers. Higher education programming that focuses on post-secondary awards of less than one year is essential for talent efforts in Advanced Manufacturing. Today, over 80% of all post-secondary credentials in the Central New York region are baccalaureate or higher. Training programs of less than one year will be essential to meet the need.

  Potential partners: BOCES, school districts, industry partners, economic development organizations, and local higher education

- **Establishment of local industry ambassador programs.**

  Industry ambassadors can provide a deeper connection to the reality of a potential job opportunity. A regional program utilizing industry representatives as proponents of Advanced Manufacturing careers could train and deploy others with the faces, voices, and stories of local communities and target populations. Their stories are most powerful when told in person and could be featured in marketing materials. Central New York's diverse population, including New American and refugees, could benefit greatly from scaling existing programs that are focused on better understanding the cultures of both New Americans and the underserved. In addition, reaching individuals through community and faith-based organizations with the message of attainable employment pathways can be effective.

  Potential partners: Industry associations and employers, chambers of commerce, and economic development organizations, local school districts

Pennsylvania Advanced Manufacturing Ambassadors
A new program will fund teams of industry ambassadors to visit select high schools, trade schools and community colleges and spark interest and awareness for manufacturing careers among students, teachers and administrators.

Goal 2: Increased training and wraparound services for underserved populations

While the unemployment rate in the region has recovered to since 2020, the size of Central New York's labor force remains slightly below pre-pandemic levels. In addition, the labor force participation rate is lower in Central New York than the state average, and the region has a higher percentage of population with a disability. These are just some of the unique circumstances that shed light on the importance of mapping, scaling, and coupling wraparound services with training programs that can make the most impact on vulnerable populations.

The following are considerations when developing training and wraparound services:

- The value proposition of training programs among vulnerable populations is centered around attainability, accessibility, funding, and placement. An assessment of the short-term, direct-hire programs in Central New York is essential, and enlisting direct-hire support from training programs and employers is a leading practice in placement and talent development.
- Short-term training programs (<1 year) are often the most effective education tools for entry into the industry. These allow for participants to upskill and enter the workforce in a relatively short time period, placing an emphasis on attainability.
- There is a direct correlation between post-secondary awards (less than associate level), unemployment rates, and increased salaries. Industry input is essential in creating training programs, but keen understanding of target populations and outreach are what can make the most impact on incumbent workforce participation.
- Regional inventory of wraparound services in the region is diverse, including specific programming that focuses on the cultural challenges, concerns, and aspirations of the New American and refugee communities.
- Embedding wraparound services into short- and long-term training programs may increase participation and awareness among underserved populations. While it is common for this programming to be created and deployed independently, the integration may more effectively reduce barriers that this population encounters when trying to enter the workforce.

Assessment of training and wraparound services in Advanced Manufacturing

Wraparound services and training were key components explored during our research on the region and in conversations with regional stakeholders.

Our main takeaways from stakeholder engagement and research were:

- Some physical training capacities exist but may be disjointed, and further collaboration is necessary to scale. Training needs are numerous, including space, equipment, consumables, instruction, curriculum, and design. Standing up training programs, particularly in Advanced Manufacturing, can prove cumbersome if one entity is responsible for all aspects. Memorandums of understanding, operating agreements, and consortiums utilizing proprietary and industry validated curriculum have proven to be effective models.

Virginia New Economy Workforce Grant Program
The Virginia General Assembly passed HB 66 which established the New Economy Workforce Grant Program. This grant program is the first of its kind and provides a pay-for-performance model for funding noncredit workforce training that leads to a credential in a high demand field.

Assessment of training and wraparound services in Advanced Manufacturing (continued)

- Traditional and emerging wraparound services can be complex to identify and expensive to deliver. For example, Central New York's dependency on cars for commuting requires job seekers to have reliable transportation. Less than 20% of jobs in the Syracuse MSA are located within a 20-minute commute, creating a need for public transportation that does not exist to necessary capacity today. Several manufacturing sites exist outside of available bus routes and the schedules for these jobs often are not aligned with bus schedules. Barriers like these can impede those who don't have access to a vehicle from pursuing jobs within the industry.
- Populations in need of training may struggle with access to common support services, including transportation and childcare. However, when these barriers are addressed, stakeholders report that there is often limited soft skills, workplace essentials, financial literacy, and basic technology skills to successfully employ this talent. Career readiness skills such as these can be developed in partnership between social services organizations and Advanced Manufacturing employers. Examples of adult training include: Successfully Completing Job Applications, Resume Workshops, Interview Practicums, etc.
- In diverse communities, cultural barriers between employers and the population may prevent engagement from displaced workers and underserved populations. In Central New York, stakeholder engagement demonstrated the need to focus on understanding the history, cultures, and interests of diverse communities to better design services and outreach that compel action from the target populations. This can be done by identifying a community advocate or representative to help design wraparound services and training programs that best address the needs of that particular community.
- While the labor force in Central New York has nearly recovered to pre-pandemic levels, labor force participation rates compared with pre-pandemic have not. This aligns with national trends in most cases and is attributed closely to worker concerns about access to and eligibility for benefits as a result of employment. Overcoming the "benefits cliff" requires outreach, education, and intentional efforts at quantifying the benefits of returning to work.

Goal 2: Potential opportunities and partners

The following are opportunities that Central New York could explore to increase capacity in wraparound services and training in its targeted sectors.

- **Career preparation, readiness, and interview practicums, hosted by coalition and supporters.**

  In conjunction with Advanced Manufacturing employers, existing coalitions can develop adult learning capacities outside of traditional higher education constructs. These programs can leverage subject-matter experts in various industries and businesses can provide workshops, information sessions, and literacy that can increase the ability for underrepresented workers to navigate the workforce ecosystem successfully. Programs that have been designed by a coalition of their peers are more likely to increase their access to and participation of their community.

  Potential partners: Industry partners and associations, local higher education, chambers of commerce, community and faith-based organizations, social services

Goal 2: Potential opportunities and partners (continued)

- **Training component mapping and needs assessment.**

  To better understand current and projected training needs, the components of training in Advanced Manufacturing skills should be enumerated, mapped, and assessed for missing capacities and easy identification of future opportunity. For example, machine and tool (CNC) manufacturers have very specific skill sets required for entry level positions. These skill sets will be different than employers in consumer electronics manufacturing. A defined set of skills and industry need will aid in designing the most relevant training programs for current and projected need.

  The essentials of training (not including funding) include:

  - Administration
  - Physical space
  - Instructors
  - Curriculum
  - Equipment
  - Modalities and schedules
  - Consumables
  - Skills mapping

- **Scaled case management and wraparound service capacities.**

  Minority unemployment rates in Central New York are measurably higher than in white communities, demonstrating the need to continue the growth and awareness of wraparound services that impact all people seeking employment or considering re-entry to the workforce. Case management, while proven successful, is perhaps the most difficult component of designing and sustaining effective wraparound services. Social service, community, and faith-based organizations often have the most access to individuals in need of training or upskilling. Similar to training components, the following steps are essential in scaling effective wraparound services:

  - Inventory – What entities in the region provide what services? How, when, and to whom? What are the existing challenges of those services, and how are they measured for success?
  - Funding – How are services funded? Is there opportunity to scale services by combining funding streams, grants, or philanthropic support?
  - Selection – Based on demographics and other considerations, what services are needed most and by whom? What services can make the most immediate and profound impact on generational poverty and employment opportunity for the underserved?
  - Deployment and collaboration – What organizations or entities are best positioned to provide the services or have administration/oversight for the program?
  - Impact – How will results be measured? How can programs adapt to meet KPIs/metrics more successfully?

  Potential partners: Social services, non-profits, employers, community and faith-based organizations, and industry partners and associations

Greater Detroit Surge Center
The SURGE Center in Greater Detroit, sponsored by Goodwill, provides employers and workers coaching in areas of life that impact employability and performance in the workplace. Individual coaches aid employees in meeting essential needs and help to minimize workplace disruption for employers.

Goal 3: Effective ecosystem collaboration to map and scale employer support services

Investments in workforce and economic development have been increasing over the last decade, and exponentially so with the rollout of federal relief programs like the American Rescue Plan. This increase in funding illustrates the level of importance the nation and individual states put on solving the current talent shortage. As the focus and funding streams for workforce development increased, more organizations entered into the broader workforce ecosystem. Unfortunately, coordination and alignment of these organizations has not kept pace. While additional programming and funding is positive, it has also created confusion in the market for employers, potential jobseekers. It's important to inventory what programs exist, what funding is available, and how resources could be used more effectively.

This is also a unique time for employers. Significant industry transformation is underway; five generations are in the workforce; there are increasingly diverse populations; and many are still recovering from the pandemic. Managing talent in this environment can be challenging. Leaders in manufacturing need a resource for understanding these various dynamics and what resources and leading practices exist to create a more competitive work environment. Enhanced industry support and regional coordination are two complementary solutions for supporting employers in Advanced Manufacturing.

Central New York specifically is home to over 200 manufacturing businesses that represent a number of different manufacturing occupations and subsectors. The industry is expected to grow exponentially in Central New York in the coming years with the announcement of a mega-fab site, and a secondary industry of suppliers and smaller manufacturing firms will follow. To better understand the talent ecosystem, employers will need accessible, real-time information on leading practices, talent management, skills development, and other information and tools that can assist in developing strategies that focus on effective talent acquisition, career latticing and development, and comprehensive understanding of leading practices to develop competitive advantages.

Here are some considerations when scaling employers' support services:

- The talent challenges facing employers in Central New York will likely not be solved by one entity alone. Solutions will require coordination and contributions from a host of partners involved in the entire workforce ecosystem — employers, educators, community-based organizations/non-profits and government organizations, to name a few.
- As the industry continues to grow and evolve, identifying the roles new and existing employers, training organizations, and social service organizations play can help reduce inefficiencies and prevent duplication of efforts in the region.
- A central repository of leading practices for talent acquisition and retention, pipeline development, and training within the region for employers can provide a consistent and up-to-date resource for any size manufacturing employer.
- Generational and cultural gaps between employers and potential new talent can result in challenges related to recruitment and talent development. Specifically in Central New York, diversity of population and diverse socio-economic factors demand that employers understand every component of the talent landscape.

Assessment of employer support services in Advanced Manufacturing

Employer support services were a key element mentioned by employers and are essential in effective workforce development.

Some key discoveries include:

- The Manufacturers Association of Central New York (MACNY) currently offers business solutions, information on partners for education and business, workforce development, and government relations. The growth of similar capacities should be prioritized, as employers report limited guidance and coordination. They often feel they don't have a clear understanding of all the tools, resources, and information necessary to make decisions on talent strategy or recruitment methods.
- During stakeholder engagement, there were several instances of people and their respective organizations being introduced to one another to collaborate. This supported comments of the limited cohesion and communication among key stakeholders within the region for the industry.
- Small to medium-size manufacturing (SMM) employers reported that they often don't have the time or financial resources to invest in trainings, workshops, or research regarding talent attraction and retention.
- Absent of clear guidance from regional entities, SMM employers have often relied on their own network of peer companies or default recruitment methods to hire the workforce they need. Some stated that because turnover rates are relatively low, there isn't a drive to increase training or hiring practices.
- With the announcement of the mega-fab site being located within the region, there will be a large talent demand. This introduces a risk for current employers whose talent may choose to work with the large enterprise.

Goal 3: Potential opportunities and partners

The following are opportunities that Central New York could explore to increase capacity for impactful employer support services in its targeted sectors.

- **Expand existing employer-networks and coordinate agreements on talent and employer outreach.**

  Growth of existing advocacy networks for manufacturing employers, including associations and leading practice support systems can promote consistency and collaboration throughout the region. Development, coordination, and sharing of training and operational agreements can enable certain employers to more easily participate in training consortiums. An information sharing agreement and/or system could also reduce the number of duplicative meetings, creating more value for employers.

  Potential partners: New York Empire State Development, New York Department of Labor, major industry associations, employers, Manufacturers' Association, Central New York REDC, industry employers, training organizations, and educators

Goal 3: Potential opportunities and partners (continued)

- **Establish a central repository of leading practices.**

  Leading practices on talent acquisition and retention, pipeline development, and training within the region for employers can provide a consistent and up-to-date resource for any size manufacturing employer. This will be important specifically for small to medium-sized manufacturers (SMMs) that often have limited resources or capacity to conduct research on industry leading practices. Reducing barriers to accessing and sharing this information may promote cohesion and consistency within the industry in CNY and allow for SMMs to compete with larger enterprises more effectively to attract and retain talent.

  Important leading practices include:

  - "Great place to work"
  - Experiential trainings
  - Earn-and-learn
  - Apprenticeships
  - Direct hire
  - Internships
  - On-the-Job
  - Career readiness skills
  - Career latticing and development

  Potential partners: Manufacturers' associations, CNY REDC, industry employers, training organizations, and social services organizations

- **Equipping employers through in-person training or virtual information sessions on leading practices.**

  Hosting in-person events for trainings and information sessions on leading practices can provide key stakeholders with up-to-date information and an offer an opportunity for organizations to network. While a central convening organization can be instrumental in connecting organizations, these types of events allow for organic relationships to be built.

  Potential partners: Manufacturers' associations, CNY REDC, industry employers, training organizations, and social services organizations

Connecticut establishes business ambassadors
The Connecticut Department of Economic and Community Development is enlisting the support of eight statewide ambassadors to conduct outreach in its target industries. These ambassadors are intended to address needs related to growth and expansion plans, talent needs and transportation access, to name a few. The program is also meant to provide a more coordinated response to industry needs so businesses are not being asked the same question by multiple entities. Data sharing, through a customer relationship management system (CRM), is one example of this more coordinated approach.

Goal 4: Sustainable talent acquisition and retention by promoting direct hire, earn-and-learn, apprenticeship and short-term training consortiums

Contemporary placement services, career coaching, and similar efforts are common in institutions of higher education and are often utilized by employers when seeking talent. These services are valuable but are designed to assist job seekers after a training program has been completed or after an assessment of incumbent skills is completed that can match them to an opportunity. In addition, data shows that talent retention increased when affinity is developed for an employer through sponsorship, financial support, or similar investments in current and future employees. Direct-hire partnerships via several hiring mechanisms could be utilized to ensure talent acquisition and retention.

Here are some considerations when developing talent acquisition and retention efforts via direct hire partnerships:

- Employers and stakeholders report that acquiring talent through traditional means is often too competitive, and there is a limited number of qualified candidates that matriculate through traditional training programs or two-year degrees in Advanced Manufacturing or related disciplines.
- Employees that are sponsored (e.g., tuition assistance, income/stipend, internship) often demonstrate a desire to stay with the organization, largely based on the affinity developed through the training and sponsorship process.
- Employers budget and spend significant money on staffing agencies. While effective at times, the competition for talent still remains, especially in disciplines like Advanced Manufacturing. There is opportunity for employers to invest the same amount or less money in developing more fruitful talent acquisition programs, and training or joining a consortium of employers in sponsoring short-term training.
- Abundant opportunity exists to demystify direct-hire, non-traditional training, sponsorship, and apprenticeship programs that can result in far more yield in candidate supply and contribute to talent retention in the region.

Assessment of challenges in talent acquisition and retention efforts in Advanced Manufacturing

Limited understanding of non-traditional recruitment, training, and sponsorship was explored during our research on the region and in conversations with regional stakeholders.

Some key discoveries include:

- Employers have a limited comprehensive understanding of the existing funding and initiatives that are available, especially surrounding apprenticeships, co-ops, and short-term proprietary training. There are often misconceptions about their roles, rights, and responsibilities as employers in deploying these models.
- Apprenticeships are commonly used across the state and region but are concentrated heavily in construction and building trades, and unions, and are not widely recognized as a turnkey talent solution for manufacturing employers.
- There is not a central location, tool, or resource for employers to understand their return on investment, commitment, legal implications, obligations, and/or commitments when engaging in a non-traditional talent acquisition program. Making operational and financial impact for employers easily calculable and accessible can further encourage participation.
- More employer participation is necessary to create a significant supply of technical talent in Advanced Manufacturing. participating in income assistance, paid internships

Goal 4: Potential opportunities and partners

The following are opportunities that Central New York employers could explore to build resilient and sustainable talent acquisition and retention efforts through promotion of direct hire opportunities.

- **Campaign to strengthen industry advocacy groups, encouraging participation in non-traditional Advanced Manufacturing consortiums and training.**

  Manufacturers Alliance of Central New York currently serves as the preeminent body advocating for employers in the Advanced Manufacturing space in Central New York. Through increased engagement of members, aggressive collaboration on income assistance, wage scales, and apprenticeship sponsorship, momentum can be created around direct-hire programming and short-term training consortiums. Coupled with effective wraparound services and sharing of resources, short-term training programs can be designed, launched, and sustained more easily.

  Potential partners: Industry associations, Central New York REDC, industry partners, local higher education, chambers of commerce, and non-profits

- **Growth and funding of wage scales in apprenticeship programs in Advanced Manufacturing.**

  Today, many employers have misperceptions of apprenticeships and their potential impact on their talent needs. It is not uncommon for apprenticeships to be viewed as only effective with unions, too expensive, cumbersome, or not easily utilized in industries outside of building and construction trades. Organizations like the Federation for Advanced Manufacturing (FAME) have developed proprietary methods, strategies, and sponsorship models that enable employers to more easily develop apprenticeships in a manner that is both compliant with United States Department of Labor (USDOL) requirements and presents the best value to the employer. In recent years, new modalities, learning systems, wage scales, and sponsorship guidelines have been enacted that make apprenticeships far easier to use than ever before.

  Potential partners: New York Department of Labor, major industry associations and employers, related technical instruction providers, and local higher education

- **Development of cooperative (co-op) education programs in manufacturing disciplines.**

  Co-op programming is characterized by close collaboration between institutions of higher education or training organizations, and employers. Traditionally, co-ops combine classroom instruction in varying modalities with hands-on learning as a part-time employee with an employer. It is not uncommon for co-op students to receive academic credit for demonstrated competencies during employment. Most co-ops provide financial support or sponsorship of students, sometimes in the form of stipends, allowances for tuition and books, or traditional wage scales paid by the employer. In many cases, internships have replaced co-ops, but a recent resurgence among employers seeking talent solutions has shown promise for this model.

  Potential partners: New York Department of Labor, major industry associations and employers, related technical instruction providers, and local higher education

Advanced Manufacturing: Strategy Implementation

Significant momentum exists in the Central New York region in developing the coalitions, support, and vision for comprehensive workforce development in the target sectors. The annual progress report developed by the Central REDC identified the key focus areas in Advanced Manufacturing that would be important to build upon. Key stakeholders in the workforce ecosystem were convened to contribute to the annual report and support the work in the scope of this project. Many of those stakeholders will play an essential role in the scaling of existing programs or the development of new programs that can make a positive impact in the region.

A key consideration in future strategy will be the timelines, eligibility, and organization of tasks necessary to successfully apply for grants, such as the Pay for Performance (Operating and Capacity-Building Awards) and Capital Grant programs, or any other future grant programs administered by the Office of Strategic Workforce Development.

Ideally, the Central REDC is positioned to support the efforts of the existing coalitions and workforce ecosystems, especially in providing ongoing guidance regarding the grant programs and alignment with regional economic and workforce priorities. Other organizations have also demonstrated the ability to convene stakeholders, which will be the first and most important task in organizing the region's strategy for the target sectors. The following considerations and steps have been developed to assess the feasibility of current and future initiatives in an organized and quantifiable manner.

Project identification and considerations

In exploring future projects or initiatives, the Central REDC, regional stakeholders, grant applicants, and others should consider:

- Does the initiative have the potential of making measurable and positive impact on the development of workforce in the target sectors? How?
- Does the initiative clearly demonstrate value in reaching underserved populations, displaced workers, ALICE workers, the underemployed, and similar demographics?
- Will the program include business and industry support in the form of direct placement, on-the-job training, industry credentials, or assistance in the development of training capacity?
- What steps are being taken to prevent duplication of efforts in the region? What individuals, entities, or organizations can assist in determining whether an existing project should be augmented or a new project considered?

Potential implementation steps

To the extent possible, project ideas and potential collaboration could be shared with the Central REDC to determine the best potential partners, identify existing and similar programs, and share guidance on the grant program and timelines. The Central REDC is likely in the best position to inform potential applicants of regional, economic, and industry developments that could benefit the grant application process or achieve economies of scale in certain efforts. In some cases, project ideas may not include utilization of OSWD grant programs. Information on the two OSWD grant tracks can also be found at this link.

Step 1: Convene

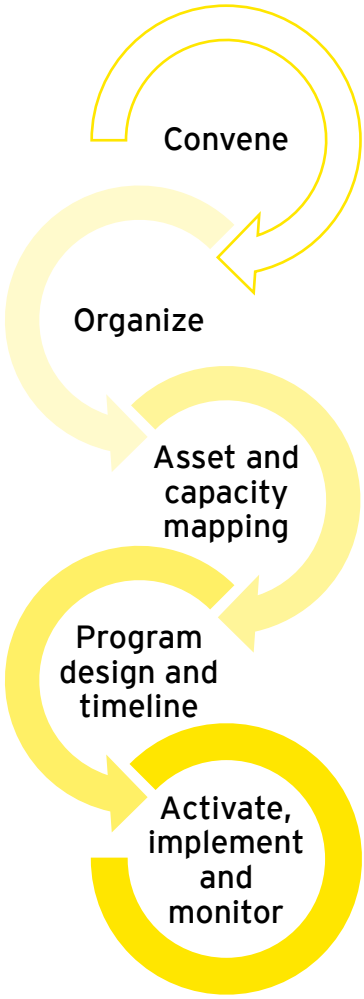
- The Central REDC has established convening ability in the region, and others have regional credibility, capacity, and interest in doing so as well.
- Project considerations should start with identifying the stakeholders, organizations, and/or individuals who could be included in preliminary discussions. The Central REDC can serve as an advisor for this process.
- For example, the establishment of an employer-sponsored, short-term training program that focuses on the rapid upskilling of recent high school graduates would likely include the following entities in Central New York: employer, MACNY, local college or university, BOCES, and local school district. Additional stakeholders including wraparound service providers, curriculum or certification bodies, or others could be included as the design of the project progresses.
- Once potential partners are identified, outreach could be conducted to convene project participants.

Step 2: Organize

- Meet to discuss the project idea, scope, and preliminary goals.
- Establish the projects relevance to the identified tradeable sector, based on these published guidelines and priorities.
- Establish a project lead, likely based on the focus of the project. For example, development of a new wraparound service could be led by an existing social service organization. The development of a new apprentice program could be led by a potential sponsor or employer.
- Organize all meetings to ensure communication, documentation, agenda items, and action items are documented and shared.

Step 3: Asset, capacity mapping

- Explore similar programs, leading practices, and enumerate required assets and capacities to launch the project or initiative.
- If utilizing OSWD grant programming, follow the application, documentation, and timeline guidance provided in the grant documentation.
- Consider what entities can contribute financial, in-kind, space, or other support that is essential for project success.
- Assess capacity of stakeholders, ensuring all required elements of the program are in place.
- Identify gaps in funding, capacity, expertise, and other assets necessary to launch the program.
- Conduct outreach to identify additional capacity and/or assets, utilizing the Central REDC and other regional stakeholders as assets.



Step 4: Program design and timeline

- If multiple project ideas exist, the Central REDC can advise in prioritizing based on the needs, workforce priorities, and established leading practices in the region.
- Program design should account for the comprehensive lifecycle of the design, launching, administration, and monitoring of the program's impact. The exact timeline for any project will vary depending on grant requirements and stakeholders involved.
- Metrics of success should be determined at the beginning of a program and be human-centered and impact-focused. During the monitor portion of a program, metrics should be assessed if they adequately capture intended impact and iterated upon if better metrics are identified. These metrics will vary from program to program, depending on grant requirements and the stakeholders involved.
- Concurrent to design, all efforts should be made to establish momentum, awareness, and inclusion of underserved populations and wraparound service providers. Both digital and grassroot efforts should be considered and employed.
- Specific timelines and goals should be created that account for program goals, partner capacities, and regional workforce priorities.

Step 5: Activate, implement, and monitor

- Consider a launch event that can draw attention and result in immediate momentum for the project. Enlist support from industry, non-profit, educational, and government leaders.
- Monitor progress and efficacy of the program through established guidelines in operating agreements, focusing on the administration and tracking of metrics and goals.
- Seek opportunities to scale the program through additional partners, assets, or marketing.

Smart Systems Cluster

A workforce development strategy for the Smart Systems Cluster in Central New York

Smart Systems Cluster research findings

CNY REDC and EY selected the Smart Systems Cluster as one of the two sectors to receive a workforce strategy based on its potential for unemployed, underemployed, and underserved job seekers, as well as its ability to promote resiliency in the regional economy.

The Smart Systems Cluster in Central New York is a rapidly evolving and important industry within the region. Today, the sector is comprised of nearly 16,000 workers among 600 Smart Systems business locations, making up a variety of subsectors including: information technology; application engineering; software development; artificial intelligence; telecommunications; and unmanned systems. Research and development are essential parts of this industry, and there are examples of strong collaboration between cluster employers and institutions of higher education.

The Smart Systems is still a largely undefined sector due to its agile and evolving nature. Agreed-upon occupation codes, skills requirements, and development of a reliable pipeline are still needed within the region to promote the sustainability of the sector. This is especially true to continue to lower barriers for underserved job seekers who desire to work in the industry.

Potential high wages, a low job turnover rate, and the industry's relevancy for employers outside of the tech definition position Smart Systems as a key tradeable sector for the region to invest in. While there are improvements that can be made to the overall industry ecosystem in CNY, these changes are attainable through employer, training provider, and social service collaboration.

Regional workforce analysis

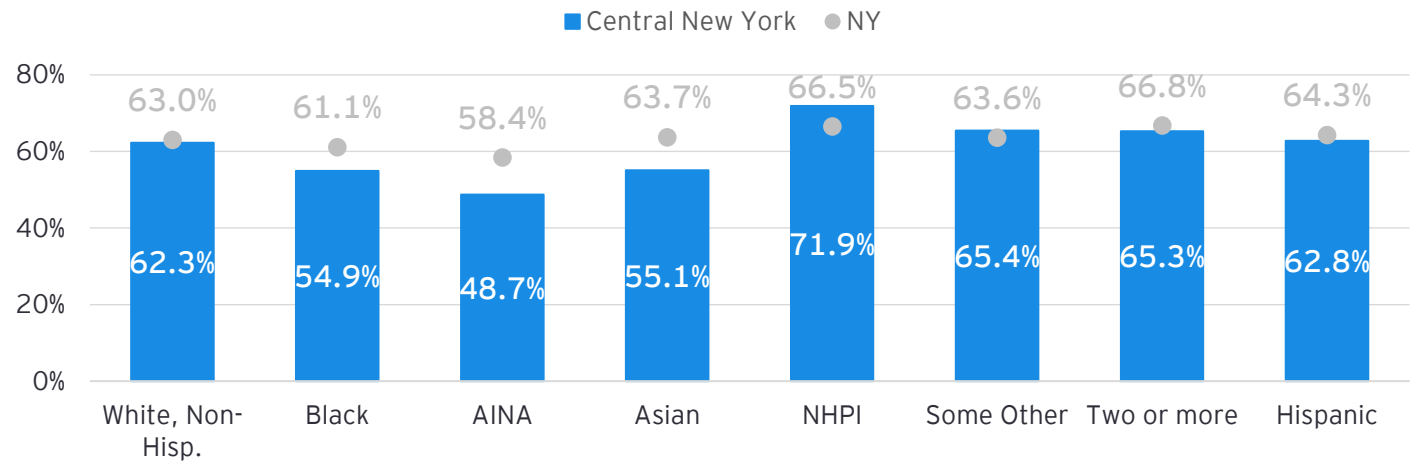
The socioeconomic and demographic trends in CNY present several areas that are primed for opportunity. Population trends by year, age, and race/ethnicity can provide insight on the region's ability to supply the labor needed to support CNY's economy. Having a solid understanding where the region currently stands provides a benchmark for future goals.

Unemployment and labor force participation

- The unemployment rate in the region has recovered to pre-pandemic levels; however, the size of the labor force remains slightly below pre-pandemic levels.
- Unemployment rates decline with higher education level and are lower than state averages for workers with some college or higher; lower-educated workers in the region, especially those with a high school education or less, are more likely to be unemployed compared with the state average.
- Black and Asian populations in Central New York have much higher unemployment than their peers across the state. Minority unemployment is much higher than white unemployment.
- The labor participation rate is lower in Central New York than the state average with mixed labor participation force rates by race and ethnicity compared with the state; labor force participation by age is on par with state averages.
- The labor force (those working or looking for work) in CNY is larger than pre-pandemic levels, and the labor participation rate is higher in CNY than the state average; still, employment in the region has yet to fully rebound to pre-pandemic levels.
- Labor participation rates in CNY are highest for people in their prime working age (25 to 54 years old). Still, older residents have higher participation rates than the state average.
- Labor participation rates by race and ethnicity are mixed. White and Hispanic participation is on par with the state average, while Black and Asian labor participation is relatively low.

The region has an opportunity to increase minority participation in the workforce

Labor force participation rate by race/ethnicity, 2020



Source:
US Census Bureau

Population trends

- The population in Central New York has been steadily declining over the past decade, but a slight uptick occurred post-pandemic. Population growth has been attributed to growth in Onondaga County and by minority populations. Still, the region is predominantly white and has smaller minority populations and relatively few foreign-born residents.
- Central New York has a higher share of young adults (15 to 24) but is under-represented by young professionals (25 to 44). The population of CNY is getting older with growth concentrated in those 65 or older. Poverty levels are comparable to the state average; however, the region has a higher percentage of the population with a disability compared with the state.

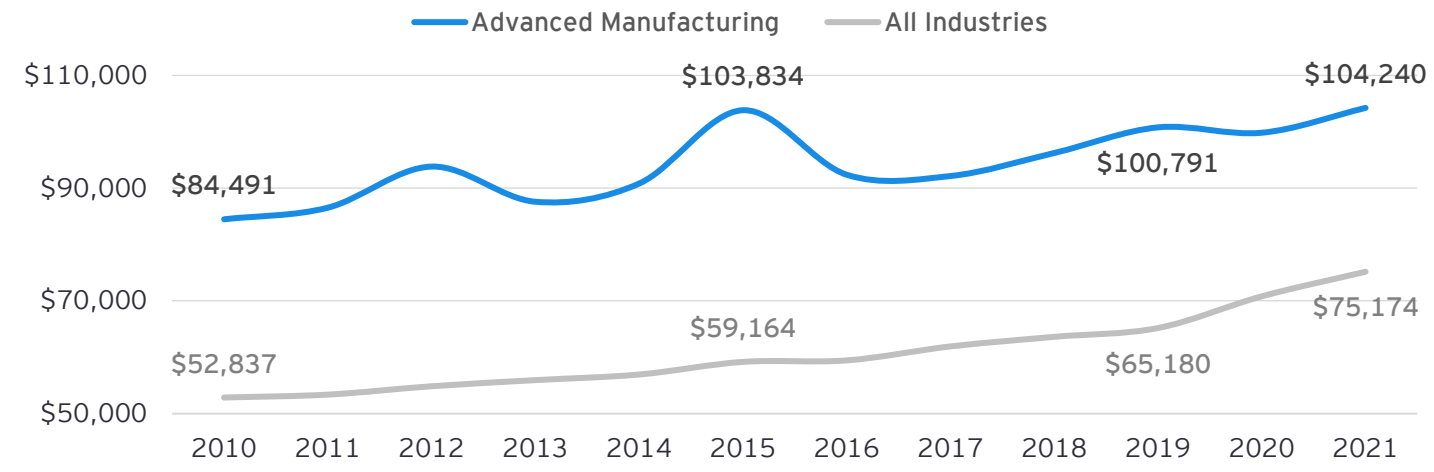
Industry analysis

Examining the overall trends facing the Advanced Manufacturing industry sheds light on the region's competitiveness to recruit, expand, and retain high-impact businesses that invest in the tax base. Equally important, these enterprises present an opportunity to offer high-quality, in-demand jobs for Central New York's unemployed, underserved, and underrepresented populations.

- Central New York worker median earnings in Smart Systems are nearly $105,000 and are 30% higher than the average of all industries.
- Central New York employment in Smart Systems has steadily grown over the past 10 years to reach nearly 16,000 workers; over 600 Smart Systems businesses are located in the region. The fastest-growing Smart Systems subsector in Central New York is Data Centers, though still small in terms of jobs. Computer and Electronics Manufacturing is the most concentrated and also fast-growing. Professional/Technical Services employs many workers but is not growing. Engineering Services and IT subsectors account for two-thirds of all Smart Systems businesses in Central New York.
- More than 45% of Central New York workers in Smart Systems are in jobs requiring a bachelor's degree or higher. Conversely, 43% of jobs require a high school diploma or less.
- Within Smart Systems, males make up most of the overall workforce (68%) in Central New York, compared with all industries, which are more evenly distributed. A large majority of Smart Systems workers are in the 25-64 age range in Central New York. A larger share of workers are in the 45- 64 range compared with all other industries.

Earnings in Advanced Manufacturing are significantly higher than the regional average

Average annual earnings, 2010 – 2021



Source:
US Census Bureau

Smart Systems Cluster occupational analysis

Talent development requires coordination among employers, educators, and training facilities. Maintaining a system-wide understanding of staffing patters, typical entry-level education, and potential earnings helps to preserve a talent pipeline that's responsive to the needs of employers and job seekers.

- There are job opportunities across each level of educational attainment in the sector. For entry-level positions with a high school diploma or less, the sector offers median hourly earnings of $22.13.
- Occupations in Smart Systems are either high-skill or low-skill (high school diploma), with electrical and miscellaneous assemblers leading high school-level jobs and software and engineers leading the bachelor's level jobs. Few jobs are needed at the certificate and associate level.
- For high school-level positions, most jobs in Smart Systems are for assemblers, inspectors, and machinists. Supervisors, clerks, and administrative occupations are also in-demand positions.
- For some college, certificate or associate-level positions, most jobs in Smart Systems are for support roles and technicians. Most in-demand positions require a certificate of associate degree with few occupations available for those with some college.
- For bachelor's or advanced positions, most jobs in Smart Systems are for software developers, operations managers, engineers, and analysts. A bachelor's degree is the most in-demand level of educational attainment.

Educational programming

A region's ability to produce talent across the entire labor spectrum is closely linked to its ability to sustain economic growth. Analyzing the output from CNY's educational programming provides insights on labor shortages, misalignment with employer needs, and clarity into workforce development investments.

General

- The adult population of Central New York trails state educational attainment levels, but bachelor's and advanced degree attainment is increasing.
- Over 80% of all postsecondary credentials produced in Central New York are at the bachelor's level or higher.
- Business programs produce the most graduates, followed by Health and Education. Health professions offer the most diverse degree award options. Large numbers of IT Master's are produced (650).
- Computer Science Master's graduates increased the most over the last five years, followed by Business Master's and Health (at all levels). Liberal Arts Associate's and Engineering Master's fell the most (possibly due to a reclassification into IT).
- Accredited certificate production is highest for at least 12 weeks but less than 1-year programs. Relatively few shorter-term certificates are produced.
- Registered apprentices have more than tripled in Central New York since 2016 and programs accepted more than 1,600 new students in 2021. Registered apprentices have more than tripled in Central New York since 2016 and programs accepted more than 1,600 new students in 2021.
- Electrician programs receive the most new apprentices each year followed by millwrights and industrial machinery mechanics.

Educational programming (continued)

Industry-specific

- Manufacturing firms, as shown in tables in the previous pages, require diverse occupations to fill jobs in Electronics Manufacturing, Metal Products Manufacturing, Professional/Technical Services, and Data Center. The gap analysis below shows that Central New York underproduces Certificate-level and Associate's graduates in manufacturing and computer occupations but generally produces adequate Bachelor's-level graduates (if the region is able to retain sufficient graduates).
- The table below shows occupation groups that are matched to degree programs to determine if the supply of graduates is sufficient to meet demand (measured as job openings in a year). A US comparison helps clarify if there is a gap or overproduction of graduates by comparing regional graduates to jobs with the US ratio of graduates to jobs (as shown in the right column below).
- Certificate-level programs either underproduce locally or not available at all. Machinists are under-produced with just 2 graduates. Industrial Production Technicians and Industrial Machinery Maintenance have no graduates to serve the 300+ annual job openings.

Supply-Demand Gap Conditions
Smart Systems, Central New York

Gap	Occupation Group	Avg. Educ. Level	Regional 2021 Job Openings	Graduates	Regional Ratio	Supply-demand Ratio versus US
	General Machinist	Certificate	164	2	1%	11%
	Electrical & Electronics Repairers	Certificate	82	32	39%	90%
	Computer Installers & Repairers	Certificate	22	0	0%	0%
	Industrial Production Technicians	Certificate	147	0	0%	0%
	Industrial Machinery Maintenance	Certificate	131	0	0%	0%
	Industrial Engineering Technicians	Associate's	32	20	63%	66%
	Mechanical Engineering Technicians	Associate's	16	33	206%	83%
	Computer Support Specialists	Associate's	124	71	57%	64%
	Electrical / Electronics Technicians & Di	Associate's	43	34	79%	293%
	Computer Hardware Engineers	Bachelor's	4	83	2075%	921%
	Mechanical Engineers	Bachelor's	79	109	138%	81%
	Computer Systems & Information Secui	Bachelor's	130	724	557%	614%
	Operations Research Analysts	Bachelor's	10	0	0%	0%
	Electrical and Electronics Engineers	Bachelor's	65	70	108%	86%
	Civil Engineers	Bachelor's	73	52	71%	75%
	Executives & Management Analysts	Bachelor's	992	1,426	144%	223%
	Engineering Managers	Bachelor's	35	0	0%	0%
	Accountants & Tax Examiners	Bachelor's	256	321	125%	259%
	Industrial Engineers	Bachelor's	76	25	33%	45%

Lg Shortage | Shortage | In-Balance | Over-Supply | Lg Over-Supply

Source:
EY analysis of data from Lightcast and US Dept. of Education

Ecosystem observations

An initial framework was developed to help assess the strengths, challenges, and opportunities within the CNY's regional Smart Systems cluster workforce development ecosystem. This framework focused on the areas of 1) industry-informed training, 2) awareness of opportunities, and 3) wraparound services and support.

The following illustration outlines the types of work within each of those focus areas:

Industry-informed training

Utilizing relationships between employers and talent pipelines is a central component of OSWD's approach to workforce development. Alignment of industry needs with career readiness, job training, and upskilling activities may expand career pathways for all segments of the labor force.

- The region is home to several training centers with tech related trainings, including CenterState CEO, the STEAM School, Erie21 at LeMoyne College, SUNY Oswego, Onondaga Community College (OCC) and the four local BOCES, to name a few.
- Select employers are engaged in developing industry-informed training with local education institutions and workforce partners. In other cases, they have limited available resources to dedicate to engaging with educators.

Awareness of opportunities

Innovation within the Smart Systems Cluster has grown the range of career opportunities. Clear definition of stakeholder roles, the target audience, and methods of promotion may increase broader awareness and participation within the sector.

- While training programs and organizations exist within the region, awareness of opportunities for untapped talent and potential partnerships between organizations may inhibit production of talent to meet labor demand.
- This awareness is impeded by the perceived accessibility of the industry. There is currently limited common language or agreement on skills necessary for jobs, impacting potential job seekers' pursuit of career opportunities. Additionally, there are jobs within the industry that a certificate or apprenticeship experience may satisfy, but job postings often require at least a bachelor's degree.
- While K-12 engagement exists within the region, coordinated campaigns and sample curriculum at various stages of K-12 pipeline may boost engagement more effectively.

Awareness of opportunities (continued)

- There is a generational gap of understanding between employers and younger, new talent. What drives younger generations is not fully aligned with what attracted older generations to the industry.
- Government and private/non-profit organizations are providing workforce development funding and assistance, especially in select sectors and for target populations, but alignment of programs could be improved, along with a reduction in the levels of bureaucracy associated with some programs.
- The region does not have a designated, resourced Smart Systems association. While consortiums (e.g., CenterState CEO) provide advocacy and services on behalf of various subsector, they are under-resourced and often dependent on grants.

Wraparound services and support

Socioeconomic barriers may hamper target populations' ability to retain a job in a regional tradeable sector, complete a career-advancement program, or participate in the labor force. Addressing these impediments through services and programs may unlock opportunities for hidden talent and the Smart Systems Cluster industry sector alike.

- Limited childcare spots for new children, high cost for parents, and low wages for caretakers may make it more difficult for some residents with children to enter the labor force.
- Central New York is a car-reliant region, requiring job seekers to have access to reliable, affordable transportation. Only 19.8% of jobs in the Syracuse MSA are located within a 30-minute commute, and jobs often are not on bus lines or don't have schedules that align with bus services.
- Veterans often have unique skills and the necessary career readiness to enter the workforce but face challenges in connecting with employers that are informed about their needs and relevant skill sets
- There are often legal and logistic barriers (e.g., obtaining a driver's license, stable housing and food) that may prevent viable candidates from participating in the workforce.
- Potential job seekers that have been out of the workforce sometimes require coaching to prepare for a job and mentoring once employed.
- For residents whose primary language is not English, traditional workforce barriers are compounded by language barriers. This is especially true for the New American population that resides in the region and that is also often navigating cultural barriers.
- Limited wraparound support services often inhibits untapped incumbent talent from workforce and/or training entry, and both job seekers and employers may struggle to navigate the available resources.

Florida Division of Early Learning Childcare Program
Families with low incomes in Florida who are trying to work or get training to work may be eligible for school readiness help. The School Readiness Program offers financial assistance to low-income families for early child education and care so families can become financially self-sufficient, and their young children can be successful in school in the future. Services vary based on individual need and range from extended day to extended year and school age care in some instances.

2 Smart Systems Cluster: Strategy framework

Industry overview

With the insights gathered through the background review and stakeholder engagement process, the following strategic framework was developed as the foundation of a sector-based workforce development plan.

The strategic framework comprises three goals, each with considerations that clarify the direction Smart Systems leaders could pursue to achieve the goal. Within each goal, an assessment of activities identifies areas that are primed for change. Opportunities are presented as potential solutions, which may be taken to address stated challenges and realize the goal.

Goals

1. Build awareness, momentum, knowledge, and pathways in Smart Systems
2. Address retention concerns via the development of career latticing and short-term training
3. Enhanced regional coordination and employer support in Smart Systems

Target populations

- Asset-Limited, Income Constrained, Employed (ALICE)
- Individuals outside of the workforce
- Talent outside of college bound students
- Graduates from local colleges and universities
- Incumbent workforce

Goal 1: Build awareness, momentum, knowledge, and pathways in Smart Systems.

Traditional occupations within the Smart Systems Cluster have existed for decades. For example, information technology and engineering are two of the most common university majors that contribute to the talent pipeline in this sector. Employers report that the subsectors and required skill sets that comprise Smart Systems are well known, but less information exists for the ecosystem to better understand the convergence of these technologies inside the Smart Systems cluster. This convergence represents an opportunity to build an industry base in Central New York that attracts more industry, investment, and opportunity to develop a regional inventory of talent. Similar to Advanced Manufacturing, awareness is essential to develop a strong talent base both with incumbent labor pools and university students who may have opportunity outside of the region. Among the biggest challenges cited by employers in this sector is talent retention. Engineering and information technology talent is in high demand, and organization among employers, local economic development organizations, higher education, and K-12 is important in articulating the regional opportunities that will result in industry growth and competitiveness.

Talent and employer support systems are equally important in the development of Smart Systems in Central New York. The talent approach is inherently different than Advanced Manufacturing, largely due to the amount of education and skills required to be successful in the sector. However, employers suggest that more non-traditional means of recruiting and developing local talent through non-baccalaureate programs is feasible, especially in information technology disciplines.

Here are some considerations regarding awareness of careers in Smart Systems:

- The STEAM High School in Syracuse is a major asset that can connect the interest and potential pathways into work and higher education for college- and non-college-bound local high school students.
- Curriculum and activities should be focused on the applied aspect of the technical discipline, making the connection with hands-on experience to industry and technical careers and preventing the activities from being viewed as extracurricular.
- Comprehensive information about career opportunities related to Smart Systems careers is important for different audiences, including parents, teachers, counselors, and economic developers seeking to recruit technology firms.
- Potential earnings for careers in Smart Systems is strong compared with other sectors. Annual salaries averaged over $100,000 in 2021, a promising statistic when considering opportunity for local talent who desires to stay in Central New York.
- Today, the sector is male-dominated. Intentional programming to diversify the talent pool can help talent acquisition and retention efforts and requires awareness and interest from students at an early age.
- To better understand the talent ecosystem, employers will need accessible, real-time information on available training programs and resources, plus leading practices on talent management, leadership, and new industry dynamics.
- Smart Systems businesses experience lower average job turnover rates compared with other industries. The sector has nearly half the turnover rate compared with all industries within the region. Employers report challenges with turnover and retention among populations that are not native to central New York.

Assessment of career awareness in Smart Systems Cluster

Awareness of Smart Systems careers was one of the key aspects of the workforce ecosystem explored during our research on the region and in conversations with regional stakeholders.

Our main takeaways from stakeholder engagement and research were:

- More than 45% of workers in Smart Systems in Central New York are in positions that require a bachelor's degree or higher. Especially in information technology-related occupations, opportunity exists to develop talent through shorter training programs, then develop the talent via career latticing and on-the-job training or proprietary upskilling. Employers acknowledge that this approach is underutilized, and it shows promise in positively impacting both talent acquisition and retention.
- Almost 40% of workers in this sector in Central New York are over 45 years old, a key statistic when understanding long-term strategy for talent development in Smart Systems. Deeper understanding of workforce demographics, perhaps through industry consortiums and establishment of industry associations, could benefit the sectors' talent considerations.
- Employers have an essential role in career opportunity awareness and talent attraction. Their presence and engagement in the community, participation in career awareness events and support of employees engaging in ambassador programs are pivotal in creating more excitement for local career opportunities. In designing their engagement, they will need to be cognizant of generational and cultural differences to capture talent that historically has not remained in Central New York.
- Regional assets and outreach programming in higher education make significant impacts in the community. ERIE 21 at LeMoyne, CASE at Syracuse, and SUNY Oswego's Innovation Challenge are all sound examples of institutions of higher education working to bridge the gap between students, workers, and industry partners. Enhancing these programs and collaborating on similar efforts will be beneficial for coordinated pipeline development.
- Employer investment in the talent development pipeline is critical. That support is not always financial, however. Collaboration with entrepreneurship, innovation, and commercialization activities in higher education, building internships, participating in area tech competitions, and serving as industry advisors to curriculum development are all recognized as effective means to developing talent pipelines.

Goal 1: Potential opportunities and partners

The following are opportunities that Central New York could explore to increase awareness and excitement for career opportunities in Smart Systems.

- **Coordinated initiatives and immersive collaboration between schools, industry, and local training centers focusing on STEAM programming, K-12 industry engagement.**

  A regional plan for employer engagement and career awareness initiatives for the K-12 pipeline could also include a plan for job shadowing, pre-apprenticeship programming, and resource sharing. Designed in partnership with industry, this plan could coordinate and build upon STEAM education curriculum, STEAM competitions, and career awareness and exposure events at an early age. Middle school, junior high, and high school initiatives could occur in individual schools, at a broader community level or regionally. The audience would include administrators, career counselors, parents and students. In some instances, new programs could be piloted in one district or school then scaled accordingly. The new STEAM school in Syracuse could be used as a model for future centers. Example programming in similar models includes applied robotics, mechanical engineering, mechatronics, cyber security, and full stack web development/coding.

  Potential partners: New York Department of Labor, New York State Education Department, New York State School Boards Association, school districts, BOCES, major industry associations, employers, and Central New York REDC

Goal 1: Potential opportunities and partners (continued)

- **Development of a regional campaign promoting the Smart Systems sector.**

  There is concern among stakeholders that the sector and corresponding occupations are not widely known. Research and development, entrepreneurship, and training all offer clear paths to careers in this sector. A regional marketing campaign shedding light on this opportunity could generate interest. Content could be optimized for various media channels and sharing platforms. Ideally, this content could be developed at the state level, focusing on the economic mobility of identified industry sectors, followed by regional campaigns supporting specific industry sectors. The goal of a campaign would be to inform the public, especially K-12, college/university, parents, and career changers about the career opportunities in Smart Systems.

  Potential partners: Empire State Development, New York Department of Labor, major industry associations and employers, Central New York REDC, local higher education, and economic development organizations

- **Establishment of a Smart Systems consortium with representatives from all parts of the workforce development pipeline and industry subsectors.**

  Workforce consortiums and/or industry associations allow for all entities engaged in the workforce pipeline to convene for awareness and assessment of current challenges and opportunities. This could include non-profits and social services organizations providing wraparound services and support for target populations, training centers and educational institutions, and government-supported workforce agencies. This effort could prove to be more difficult in Smart Systems than other industries, as the cluster itself is the sum of many subsectors, including information technology, engineering, and telecommunications. Convening a group of this nature would require an assessment of the common skill sets, worker profiles, and related challenges to develop a cohesive engagement strategy but could yield significant momentum in awareness of the sector and careers.

  Potential partners: Major industry associations and employers, Central New York REDC, and local higher education

Georgia Electric Mobility and Innovation Alliance (EMIA)
EMIA's mission is to support the growth of the entire electric mobility industry and foster innovation in the State of Georgia by creating a business-friendly environment for the industry and promoting favorable public policy. While this alliance has the long-term goal to bring new investments to Georgia, it also seeks to support the state's existing industry throughout the ongoing transition of the automotive industry.

- **Development of non-traditional recruitment programs into the Smart Systems Cluster, including dual-enrollment, experiential learning, and apprenticeships.**

  Smart Systems employers agree that non-traditional pathways have merit. Scaling dual-enrollment programs in technical disciplines can create accelerated pathways for high school graduates who are not university-bound. Higher education programming that focuses on post-secondary awards of less than one year is essential for the development of career options in Smart Systems for populations that may not have access to traditional university education. Apprentice programs show promise in this model and can contribute to talent retention by developing worker loyalty among trainees. Today, over 80% of all post-secondary credentials in the Central New York region are baccalaureate or higher. Training programs of less than one year, especially in coding, web development and network administration will be essential.

  Potential partners: BOCES, school districts, industry partners, economic development organizations, and local higher education

Goal 2: Address retention concerns via the development of career latticing and short-term training

Short-term training programs in careers that require advanced skill sets can be challenging to design and launch. Smart Systems employers report that in addition to traditional recruiting, short-term training programs can present opportunities to develop employees with on-the-job training, continuing education, and upskilling in the workplace. While this is not a comprehensive solution to talent concerns in Smart Systems, it does offer pathways into the industry that can be meaningful for local populations seeking to change careers or re-enter the workforce. Skills mapping is an important part of this process, as any effective short-term training program would require reconciliation of training inventory with necessary skills to contribute at an entry-level position. Given the array of subsectors within Smart Systems, this is an essential first step in considering relevant training programs. In addition, it can present opportunities to sponsor employees, hire part-time talent, and increase retention rates with workers.

Here are some considerations when developing talent acquisition and retention efforts via direct-hire partnerships:

- Employers and stakeholders report that acquiring talent through traditional means is often too competitive and there is limited candidate supply among bachelor's-level graduates in Smart Systems-related disciplines.
- Employees who are sponsored (e.g., tuition assistance, income/stipend, internship) often demonstrate a desire to stay with the organization, largely based on the affinity developed through the training and sponsorship process.
- Employers budget and spend significant money on staffing agencies. While effective at times, the competition for talent remains, especially in competitive industries like Smart Systems. There is an opportunity for employers to invest money in developing more fruitful talent acquisition programs, and training or joining a consortium of employers in sponsoring short-term training.
- Abundant opportunity exists to demystify direct-hire, non-traditional training, sponsorship, and apprenticeship programs that can result in far more yield in candidate supply and contribute to talent retention in the region.

Assessment of challenges in talent acquisition and retention efforts in Smart Systems

Limited understanding of non-traditional recruitment, training, and sponsorship was explored during our research on the region and in conversations with regional stakeholders.

Some key discoveries include:

- Employers have a limited comprehensive understanding of the existing funding and initiatives that are available, especially surrounding apprenticeships, co-ops, and short-term proprietary training. There are often misconceptions about their roles, rights, and responsibilities as employers in deploying these models.
- Apprenticeships are commonly used across the state and region but are concentrated heavily in construction and building trades and unions and are not widely recognized as a turnkey talent solution for Smart Systems employers.
- There is not a central location, tool, or resource for employers to understand their return on investment, commitment, legal implications, obligations, and/or commitments when engaging in a non-traditional talent acquisition program. Making operational and financial impact for employers easily calculable and accessible can further encourage participation.
- Employers need technical assistance in defining the skill sets that are relevant to their operations.

Goal 2: Potential opportunities and partners

The following are opportunities that Central New York employers could explore to build resilient and sustainable talent acquisition and retention efforts through promotion of direct-hire and training opportunities.

- **Establishment of programming that combines the mission of incubation centers with specific skills and operational needs of Smart Systems employers and provides opportunity for technical talent to gain work-based experience.**

  The region is host to a number of innovation and entrepreneurship centers, both in university settings and as a result of collaborations outside of higher education. While these centers typically provide services to individuals in technology related commercialization, Smart Systems employers report that they rarely result in tangible talent pipelines for their operations. More opportunity exists for employer-sponsored work-based experiences inside of innovation centers, allowing technology or engineering students and entrepreneurs the chance to pursue work-based learning, part-time employment, or project-based income with local startups and established employers. Doing so would require significant investments in time and varying financial investments from employers, but it could act as a catalyst in talent recruitment.

  Potential partners: Innovation, entrepreneurship, and incubation centers, industry partners, industry associations, and Central New York REDC

- **Development of an upskilling consortium, focused on identification of the most urgently needed skill sets as a guide to training development.**

  Employers report that they are consistently challenged with talent retention and skills development of technology employees. In Central New York, talent retention is especially challenging with foreign-born talent, and the upskilling of incumbent employees is seen as a pathway to increase retention in the region. Potential exists in launching a technology upskilling consortium, consolidating the capacities of employers, training providers and industry associations, that provides continuing education to incumbent smart systems workers.. This could ease the training burden on employers while contributing to the growth of the ecosystem. Upskilling programs could focus on the shortest possible path to competencies in information technology or related smart systems program and project management.

  Potential partners: Employers, industry associations, local higher education, economic development organizations, and community-based organizations

- **Development of cooperative (co-op) education programs in Smart Systems majors.**

  Co-op programming is characterized by close collaboration between institutions of higher education or training organizations, and employers. Traditionally, co-ops combine traditional classroom instruction in varying modalities with hands-on learning as a part-time employee with an employer. It is not uncommon for co-op students to receive academic credit for demonstrated competencies during employment. Most co-ops provide financial support or sponsorship of students, sometimes in the form of stipends, allowances for tuition and books, or traditional wage scales paid by the employer. In many cases, internships have replaced co-ops, but a recent resurgence among employers seeking talent solutions has shown promise for this model. In addressing development of non-traditional talent and increasing retention rates, co-ops can be an effective tool.

  Potential partners: New York Department of Labor, major industry associations and employers, related technical instruction providers, and local higher education

Goal 3: Enhanced regional coordination and employer support in Smart Systems

As the Smart Systems sector has grown in Central New York, the ability for employers to have actionable and real-time information to make operational and talent decisions has become more difficult. Employers report that understanding skills and educational requirements is complex. This is complicated further by contemporary workforce issues. Unfortunately, coordination and alignment of support systems have not kept pace.

Smart Systems is characterized by the rapid evolution of technologies, and the information needed for employers to make actionable business decisions is not centralized. Moreover, the region may struggle with identifying a central convening industry organization to advocate for the systems, process, and organization necessary. Leaders in Smart Systems need a resource for understanding these various dynamics and what resources and leading practices exist to create a more competitive work environment.

Here are some considerations regarding enhanced regional coordination of employer support in Smart Systems:

- The talent challenges facing employers in Central New York will likely not be solved by one entity alone. Solutions will require coordination and contributions from a host of partners involved in the entire workforce ecosystem — employers, educators, community-based organizations/non-profits and government organizations, etc.
- To better understand the talent ecosystem, employers will need accessible, real-time information on available training programs and resources, coupled with leading practices on talent management, leadership, and new industry dynamics.
- Inventorying and assessing the programs, targets and funding sources of all partners in the workforce ecosystem is a critical first step in identifying gaps and opportunities and in aligning efforts moving forward. A better understanding of the available resources and their limitations will also support more effective allocation of these funds.

Assessment of regional coordination and industry support in Smart Systems cluster

Regional coordination and industry support were common discussion points shared in our stakeholder conversations.

Some key observations include:

- While there are some national resources on all subsectors in Smart Systems, there is not of a "one stop shop" resource for Smart Systems employers in Central New York to turn to when facing talent shortage or operational concerns.
- The region has a limited presence of a well-resourced industry association that has a comprehensive understanding of the sector and its challenges, especially related to employer services. In addition, employers may struggle with finding the necessary time and resources to engage with educational institutions or other entities that can help.
- The Central New York REDC is already serving as a champion and convener of this strategy but has limited resources for activation. The region could benefit from a single unified entity for convening ecosystem partners and activating a shared plan for workforce development and talent retention.

Goal 3: Potential opportunities and partners

The following are opportunities that Central New York could explore to enhance regional coordination and support of Smart Systems:

- **Support for a fully resourced Smart Systems association with a complete suite of services.**

  Industry associations provide a platform for employers of all sizes to convene for discussions on leadership, talent, current skills needs, and changing industry dynamics. It can also be a platform for sharing leading practices, activating shared initiatives, and enhancing overall collaboration. Such an organization could also take ownership of much of this strategy.

  Sample initiatives they could tackle:

  - Identification and awareness for engagement opportunities (e.g., industry ambassador programs, networks/initiatives for diverse populations, shared apprenticeships)
  - Developing a common language for necessary skills and trainings to promote consistency for the industry and the region
  - Ongoing skill needs/assessment
  - Education and trainings for how to be an "employer of choice" (e.g., company culture, cultural understanding, flexible work arrangements)

  Potential partners: NY ESD, REDC, IDAs, Chambers of Commerce, and industry associations

- **An inventory and assessment of existing workforce programs, target populations, and funding sources. Comprehensive skills mapping services.**

  A high-priority task for the consortium would be to develop a comprehensive inventory that could be used to create an asset map of resources for potential jobseekers and employers but could also be the foundation for an assessment that maps funding sources, program targets, and programs to identify gaps and challenges and ways to utilize resources most effectively.

  Potential partners: New York Department of Labor and other government-affiliated workforce agencies, Department of Health and Human Services, non-profits, and education and training providers

- **Creation of a smart systems technology talent guide or knowledge base for employers.**

  Smart systems employers in the region could benefit from the establishment of an interactive virtual resource guide, published periodically, that provides real-time intelligence on trends in training, upskilling, onboarding practices, wraparound services, non-traditional recruitment, and opportunities to participate in short-term training. This guide can be developed through collaboration with local entities, contributing to the growth, training capacity, and retention in the sector.

  Potential partners: Central REDC, industry associations, employers, economic development organizations, local higher education, and community-based organizations

Smart Systems Cluster Strategy Implementation

Significant momentum exists in the Central New York region in developing the coalitions, support, and vision for comprehensive workforce development in the target sectors. The annual progress report developed by the Central REDC identified the key focus areas in the Smart Systems Cluster that would be important to build upon. Key stakeholders in the workforce ecosystem were convened to both contribute to the annual report and support the work in the scope of this project. Many of those stakeholders will play an essential role in the scaling of existing programs or the development of new programs that can make a positive impact in the region.

A key consideration in future strategy will be the timelines, eligibility, and organization of tasks necessary to successfully apply for grants, such as the Pay for Performance (Operating and Capacity-Building Awards) and Capital Grant programs, or any other future grant programs administered by the Office of Strategic Workforce Development.

Ideally, the Central REDC is best positioned to support the efforts of the existing coalitions and workforce ecosystems, especially in providing ongoing guidance regarding the grant programs and alignment with regional economic and workforce priorities. Other organizations have also demonstrated the ability to convene stakeholders, which will be the first and most important task in organizing the region's strategy for the target sectors. The following considerations and steps have been developed to assess the feasibility of current and future initiatives in an organized and quantifiable manner.

Project identification and considerations

- In exploring future projects or initiatives, the Central REDC, regional stakeholders, grant applicants, and others could consider:
- Does the initiative have the potential of making measurable and positive impact on the development of workforce in the target sectors? How?
- Does the initiative clearly demonstrate value in reaching underserved populations, displaced workers, ALICE workers, the underemployed, and similar demographics?
- Will the program include business and industry support in the form of direct placement, on-the-job training, industry credentials, or assistance in the development of training capacity?
- What steps are being taken to prevent duplication of efforts in the region? What individuals, entities, or organizations can assist in determining whether an existing project should be augmented or a new project considered?

Potential implementation steps

To the extent possible, project ideas and potential collaboration could be shared with the Central REDC to determine the best potential partners, identify existing and similar programs, and share guidance on the grant program and timelines. The Central REDC is likely in the best position to inform potential applicants of regional, economic, and industry developments that could benefit the grant application process or achieve economies of scale in certain efforts. In some cases, project ideas may not include utilization of OSWD grant programs. Information on the two OSWD grant tracks can also be found at this link.

Step 1: Convene

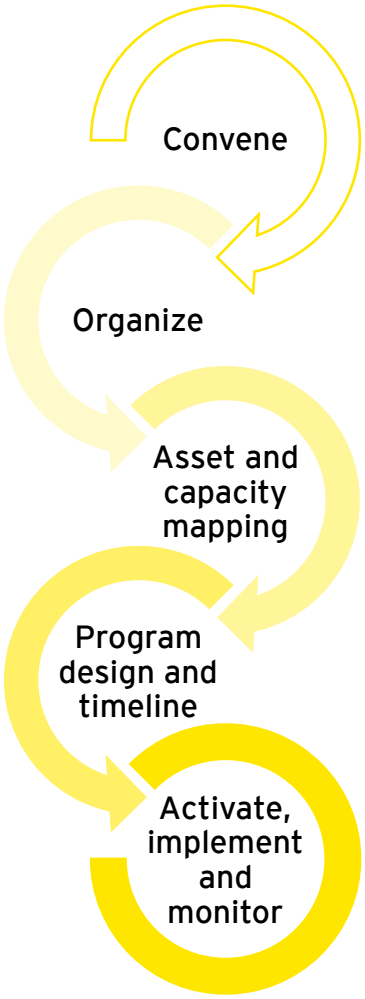
- The Central REDC has established convening ability in the region, and others have regional credibility, capacity, and interest in doing so as well.
- Project considerations should start with identifying the stakeholders, organizations, and/or individuals who could be included in preliminary discussions. The Central REDC can serve as an advisor for this process.
- For example, the establishment of an employer-sponsored, short-term training program that focuses on the rapid upskilling of recent high school graduates would likely include the following entities in Central New York: employer, MACNY, local college or university, BOCES, and local school district. Additional stakeholders including wraparound service providers, curriculum or certification bodies, or others could be included as the design of the project progresses.
- Once potential partners are identified, outreach could be conducted to convene project participants.

Step 2: Organize

- Meet to discuss the project idea, scope, and preliminary goals.
- Establish the projects relevance to the identified tradeable sector, based on these published guidelines and priorities.
- Establish a project lead, likely based on the focus of the project. For example, development of a new wraparound service could be led by an existing social service organization. The development of a new apprentice program could be led by a potential sponsor or employer.
- Organize all meetings to ensure communication, documentation, agenda items, and action items are documented and shared.

Step 3: Asset, capacity mapping

- Explore similar programs, leading practices, and enumerate required assets and capacities to launch the project or initiative.
- If utilizing OSWD grant programming, follow the application, documentation, and timeline guidance provided in the grant documentation.
- Consider what entities have the ability to contribute financial, in-kind, space, or other support that is essential for project success.
- Assess capacity of stakeholders, ensuring all required elements of the program are in place.
- Identify gaps in funding, capacity, expertise, and other assets necessary to launch the program.
- Conduct outreach to identify additional capacity and/or assets, utilizing the Central REDC and other regional stakeholders as assets.



Step 4: Program design and timeline

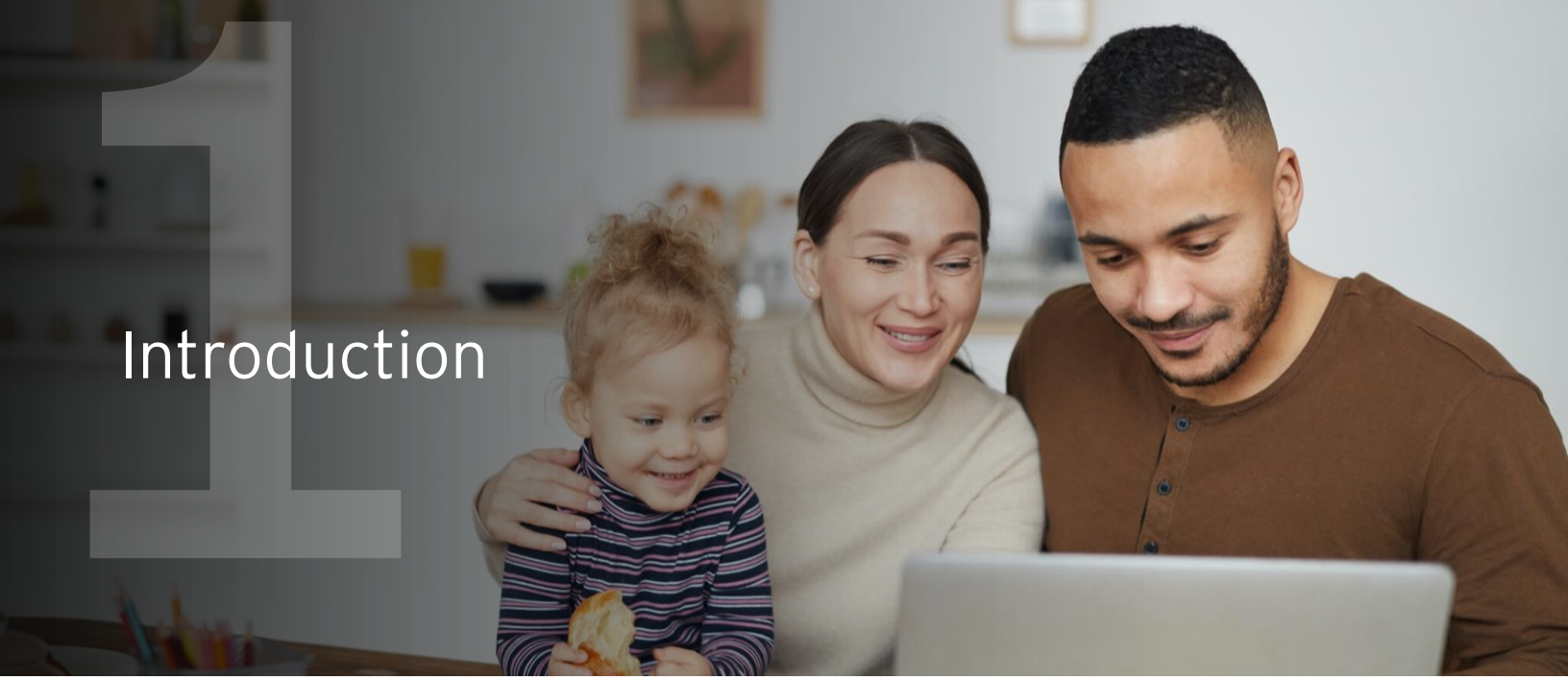
- If multiple project ideas exist, the Central REDC can advise in prioritizing based on the needs, workforce priorities, and established leading practices in the region.
- Program design should account for the comprehensive lifecycle of the design, launching, administration, and monitoring of the program's impact. The exact timeline for any project will vary depending on grant requirements and stakeholders involved.
- Try to determine metrics of success at the beginning of a program and be human-centered and impact-focused. During the monitor portion of a program, metrics could be assessed if they adequately capture intended impact and iterated upon if better metrics are identified. These metrics will vary from program to program, depending on grant requirements and the stakeholders involved.
- Concurrent to design, all efforts could be made to establish momentum, awareness, and inclusion of underserved populations and wraparound service providers. Both digital and grassroot efforts could be considered and employed.
- Specific timelines and goals should be created that account for program goals, partner capacities, and regional workforce priorities.

Step 5: Activate, implement, and monitor

- Consider a launch event that can draw attention and result in immediate momentum for the project. Enlist support from industry, non-profit, educational, and government leaders.
- Monitor progress and efficacy of the program through established guidelines in operating agreements, focusing on the administration and tracking of metrics and goals.
- Seek opportunities to scale the program through additional partners, assets, or marketing.

Appendix A

Research appendix



1 Introduction

Introduction to Research Appendix

As part of the Phase II work to develop a Regional Sector-Based Workforce Development Strategy for Central New York, EY produced new research and analysis to supplement research produced by Empire State Development (ESD) and the Regional Economic Development Council (REDC) during Phase I as well as previous reports.

This Research Appendix includes data and findings on the following:

- Regional workforce conditions
- Industry analysis on the two target sectors: Advanced Manufacturing and Smart Systems
- Occupational analysis of the two target sectors
- Educational programming that supports overall workforce development and the programming specific to the two target sectors

This supplemental research aims help to inform the workforce development planning process and the development of strategies for each of the target sectors.

2 Regional workforce conditions

About this chapter

In this chapter, we seek to understand the social and economic trends within the region, as well as validate potential barriers facing the community. We examine components of population growth, economic indicators, potential barriers to employment and regional migration. Key metrics in this chapter include:

- Population trends by year, age, and race/ethnicity
- Monthly unemployment rate
- Size of labor force by month
- Potential barriers to employment
- Migration trends
- Unemployment by year, age, race/ethnicity, and education level
- Labor force participation rate by year, age, race/ethnicity, and education level

Insights from this analysis can provide a high-level understanding of the talent pipeline and the region's ability to supply the labor needed to support the Central region's economy.

Key findings

- The population in Central New York has been steadily declining over the past decade, but a slight uptick occurred post-pandemic. Population growth has been attributed to growth in Onondaga County and by minority populations.
- Still, the region is predominantly White and has smaller minority populations and relatively few foreign-born residents.
- Central New York has a higher share of young adults (15-24) but is under-represented by young professionals (25-44).

2 Regional workforce conditions

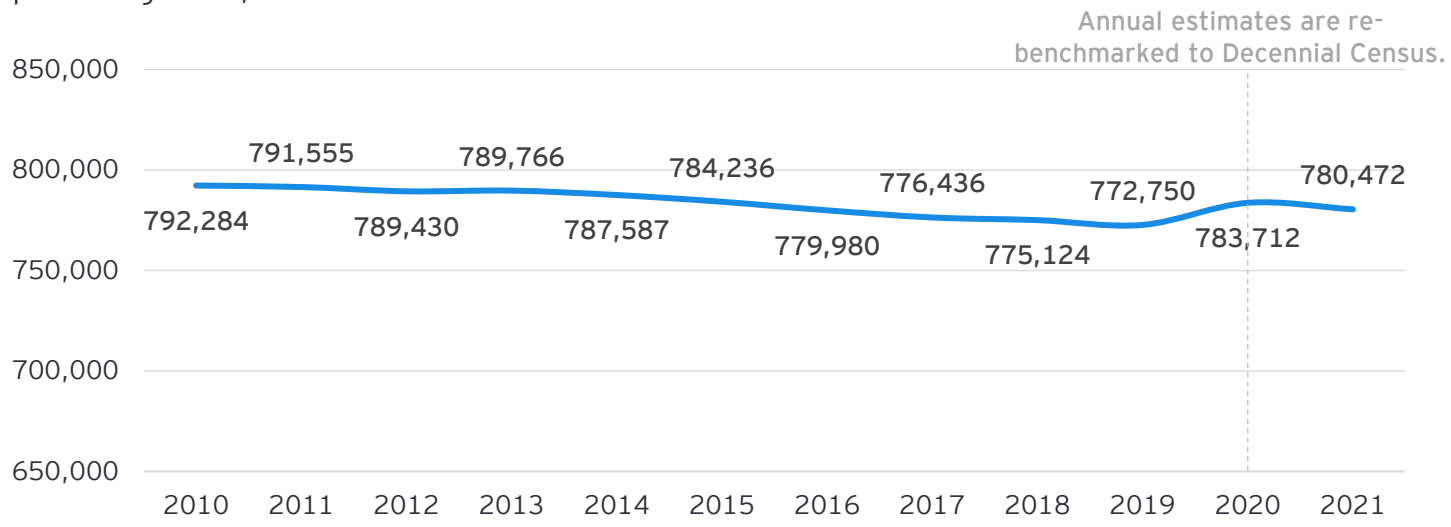
Key findings, *continued*

- The unemployment rate in the region has recovered to pre-pandemic levels, however, the size of the labor force remains slightly below pre-pandemic levels.
- Unemployment rates decline with higher education level and are lower than state averages for workers with some college or higher; lower-educated workers in the region, especially those with a high school education or less, are more likely to be unemployment compared to the state average.
- The labor force participation is higher in advanced education levels.
- Unemployment rates are higher for White Non-Hispanic, Black, Asian, Other, and Hispanic residents in the region compared to the state.
- The labor participation rate is lower in Central New York than the state average with mixed labor participation force rates by races and ethnicity compared to the state; labor force participation by age is on par with the state averages.
- Poverty levels are comparable to the state average; however, the region has a higher percentage of the population with a disability compared to the state.
- Non-resident workers commuting into the region is slightly more than residents who commute out of the region to find work but is relatively balanced. Net commuters out of Central New York are in Health Care Support, Business Operations, and Protective Service positions.
- Most jobs lost during the pandemic were in Health Care, Accommodation and Restaurants, and Government. Government and Wholesale lost a large 12% of their job base.

Workforce

The Central New York population has been steadily declining over the past decade, but a slight uptick occurred post-pandemic.

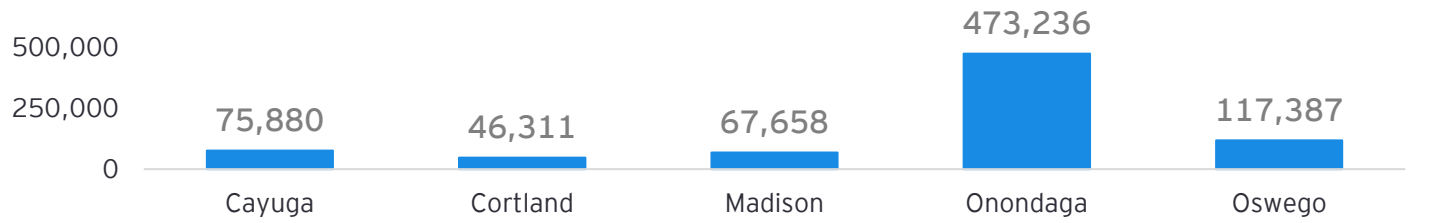
Population growth, 2010 - 2021



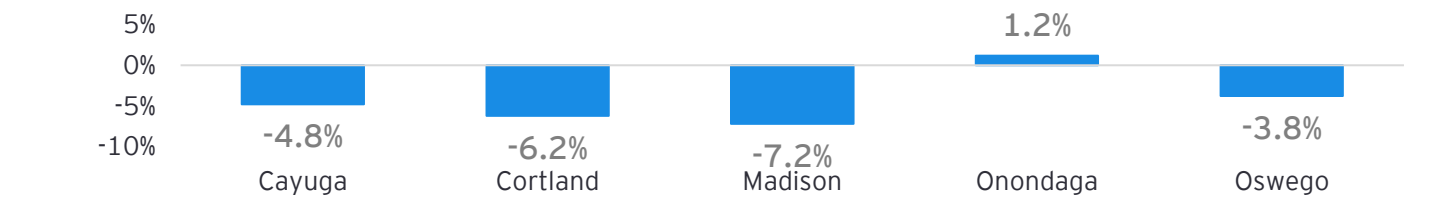
Source:
US Census Bureau

All counties within Central New York experienced declines in population over the last decade, while Onondaga County experienced a small increase.

Population, 2021



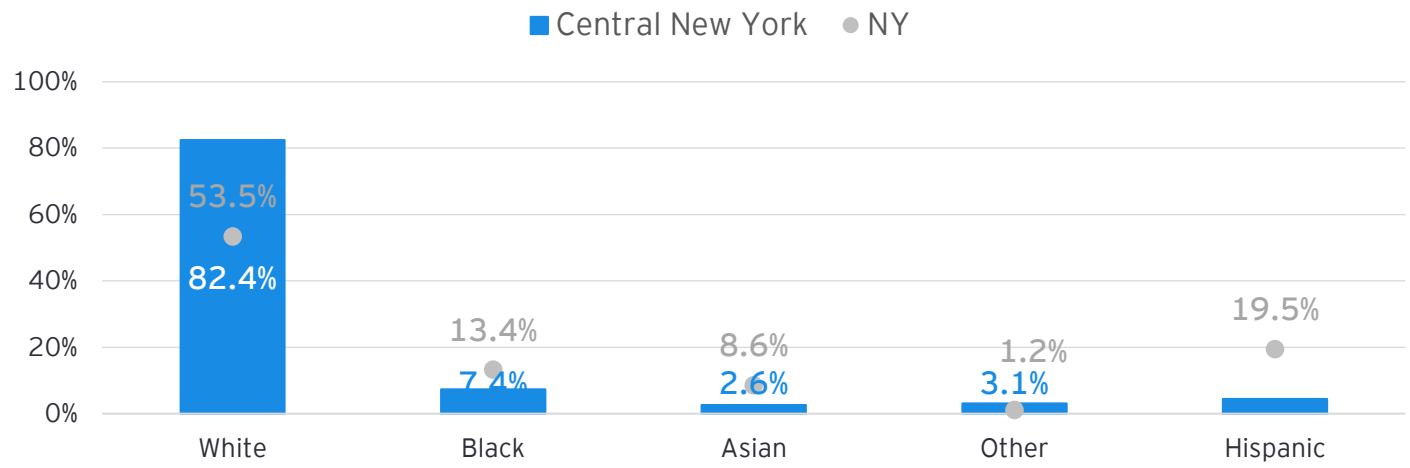
Population growth, 2011 to 2021



Source:
US Census Bureau

The population of Central New York is predominantly White. Black populations are about half the state average, but Asian and Hispanic populations are relatively small.

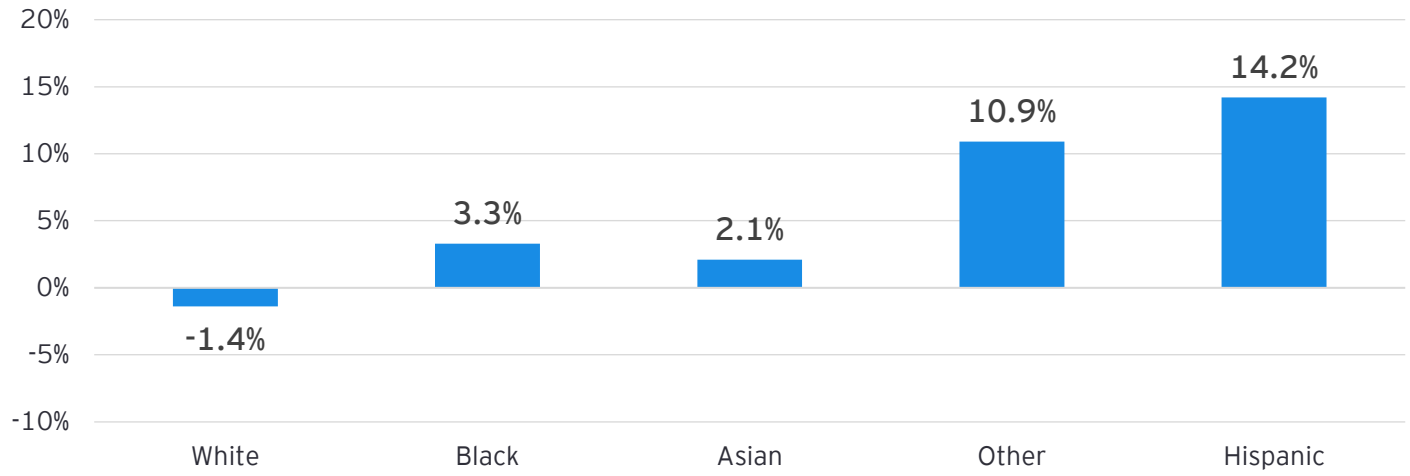
Population by race/ethnicity, 2021



Source:
US Census Bureau

Still, diversity in Central New York is increasing led by the Hispanic population and followed by Other. The White (non-Hispanic) population is declining.

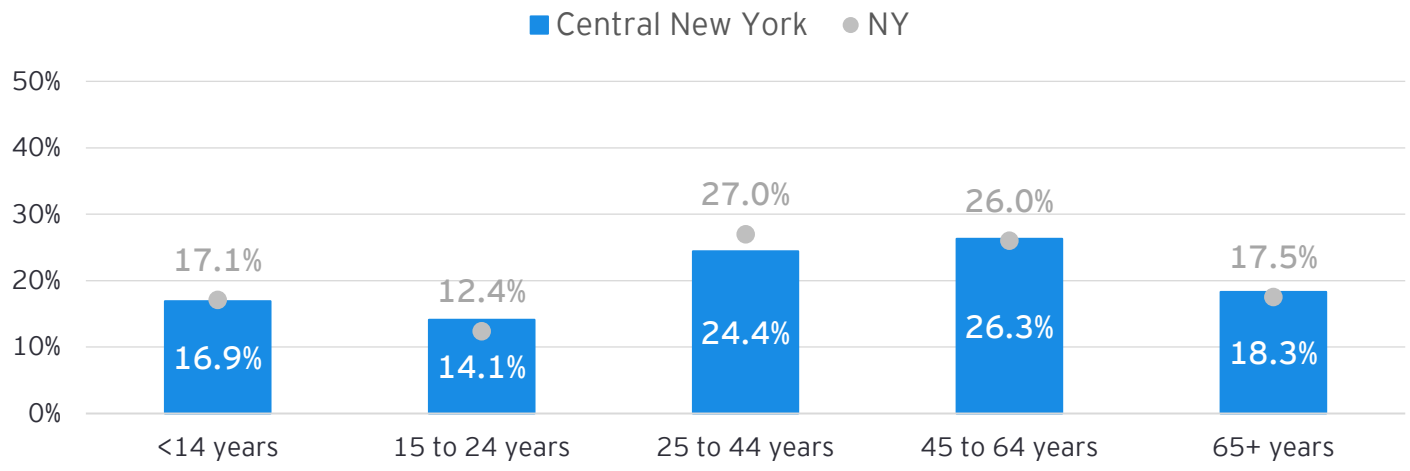
Population growth by race/ethnicity cohort as share of total population, 2016 - 2021



Source:
US Census Bureau

Central New York has a higher share of young adults (15-24) but is under-represented by young professionals (25-44).

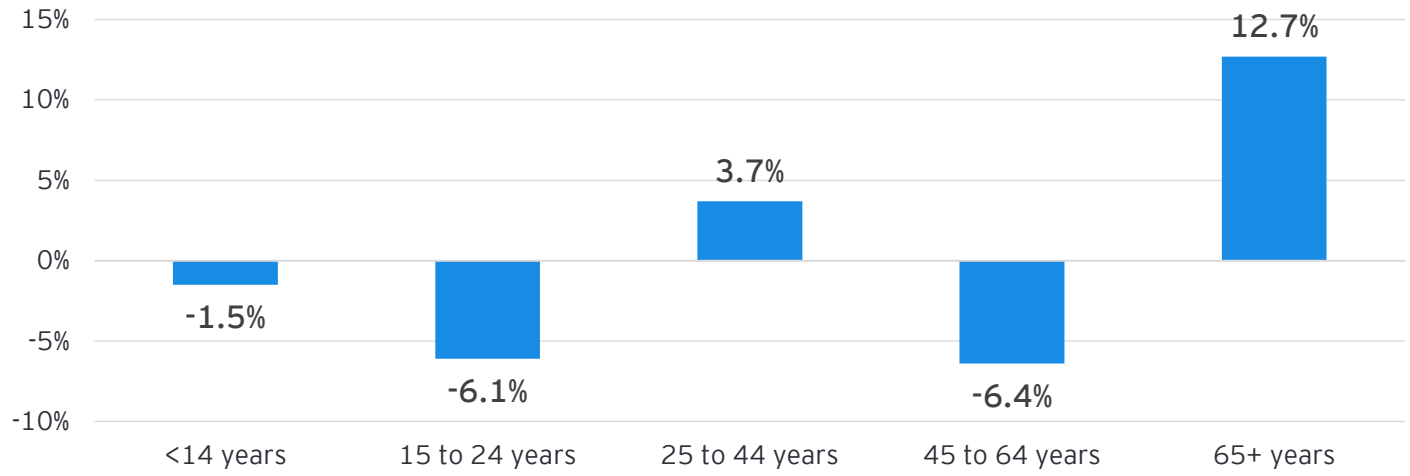
Population by age, 2021



Source:
US Census Bureau

Central New York's retirement age population (65+) has grown the fastest, followed by young professionals (25-44). All other age groups have declined.

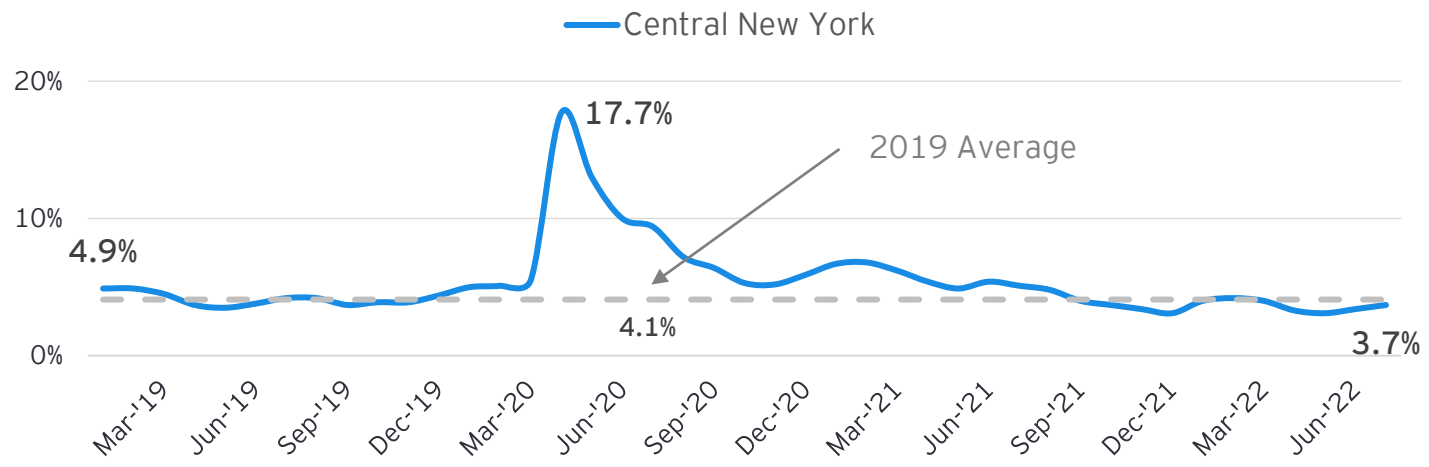
Population growth by age, 2016 - 2021



Source:
US Census Bureau

The unemployment rate in Central New York has fallen below pre-pandemic levels.

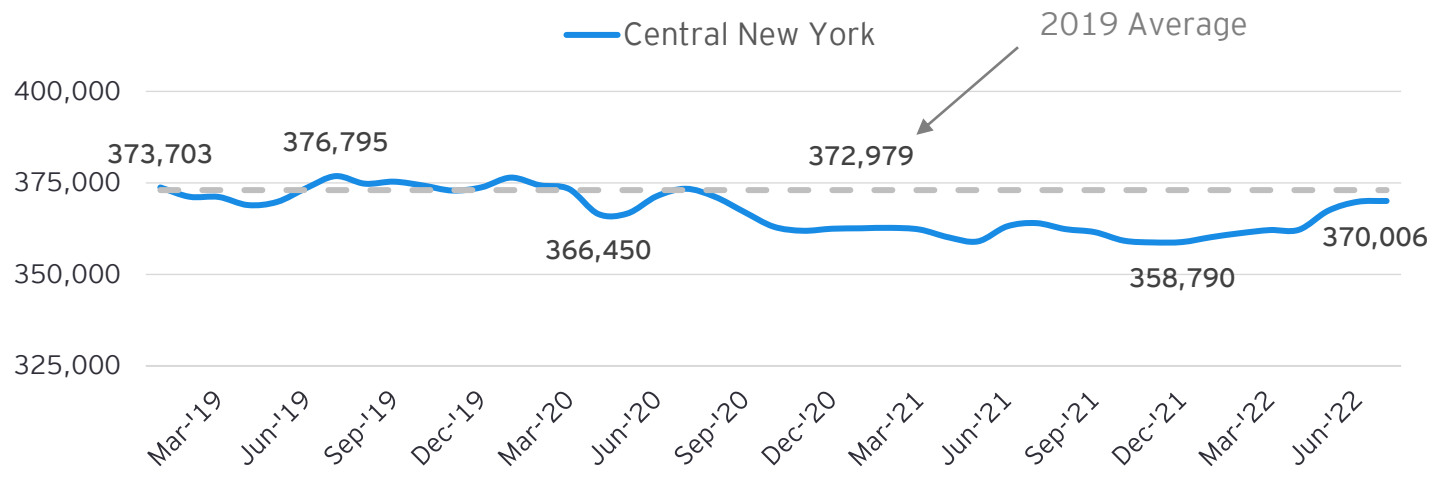
Unemployment rate by month, Jan. 2019 - July 2022



Source:
US Bureau of Labor Statistics

The labor force (those working or looking for work) in Central New York has nearly recovered to pre-pandemic levels.

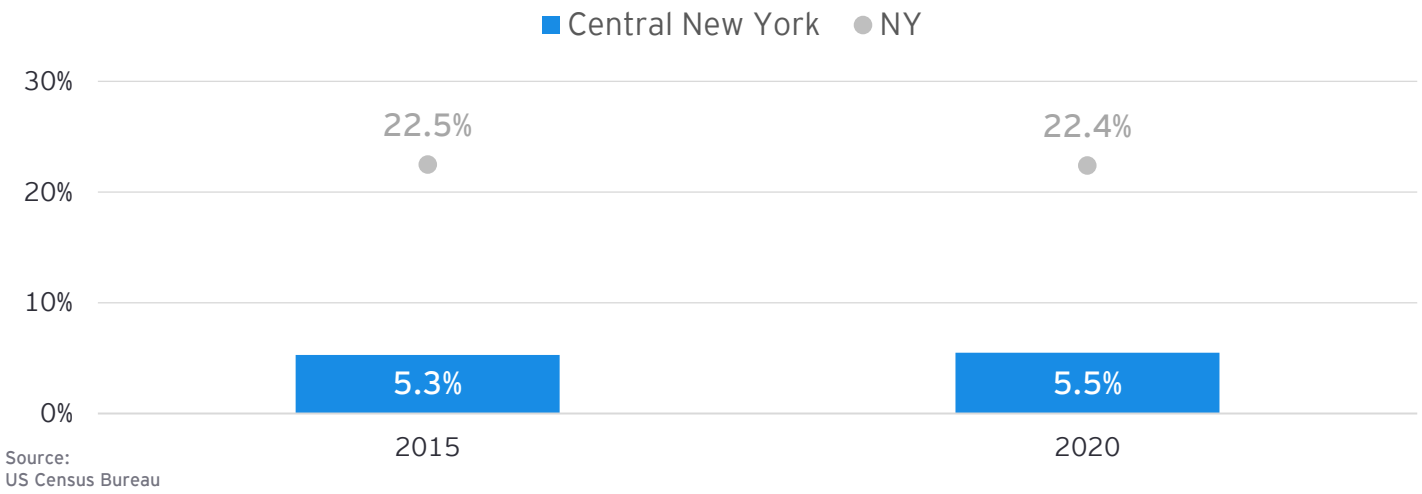
Labor force size by month, Jan. 2019 - July 2022



Source:
US Bureau of Labor Statistics

The foreign-born population in Central New York is relatively small but is growing slightly.

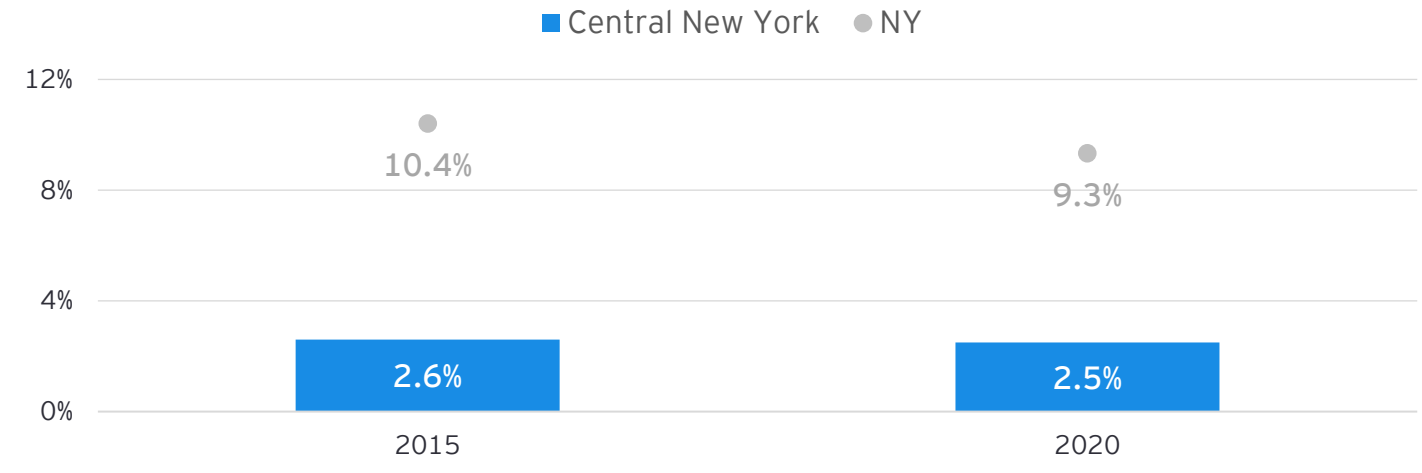
Foreign born as % share of population, 2015 - 2020



Source:
US Census Bureau

The number of non-U.S. citizens in Central New York is also relatively small compared to the state average.

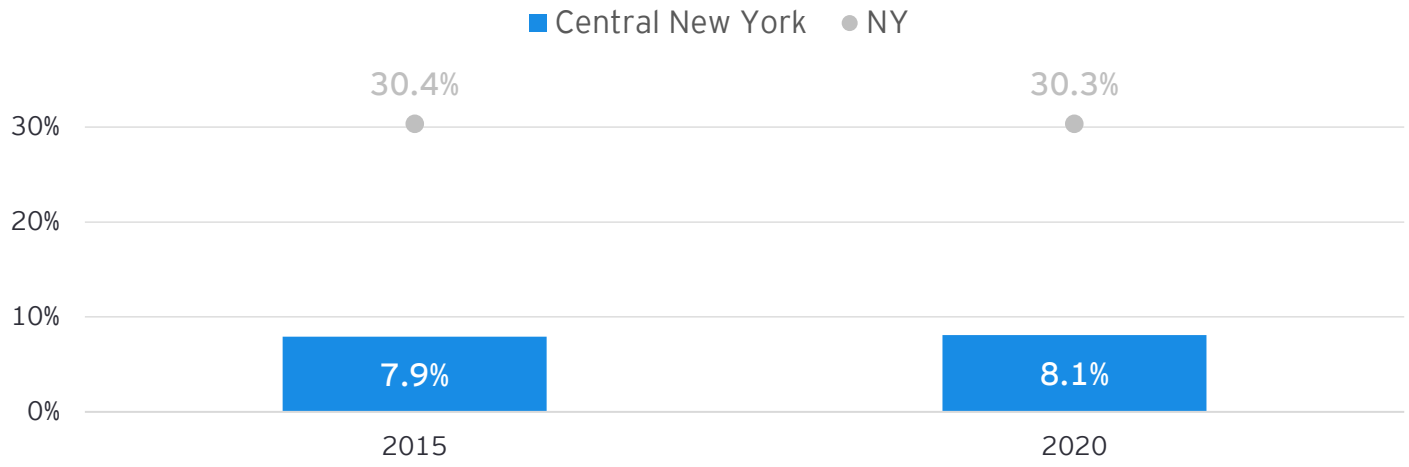
Non-citizens as % share of population, 2015 - 2020



Source:
US Census Bureau

About 8% of residents speak a non-English language at home in Central New York.

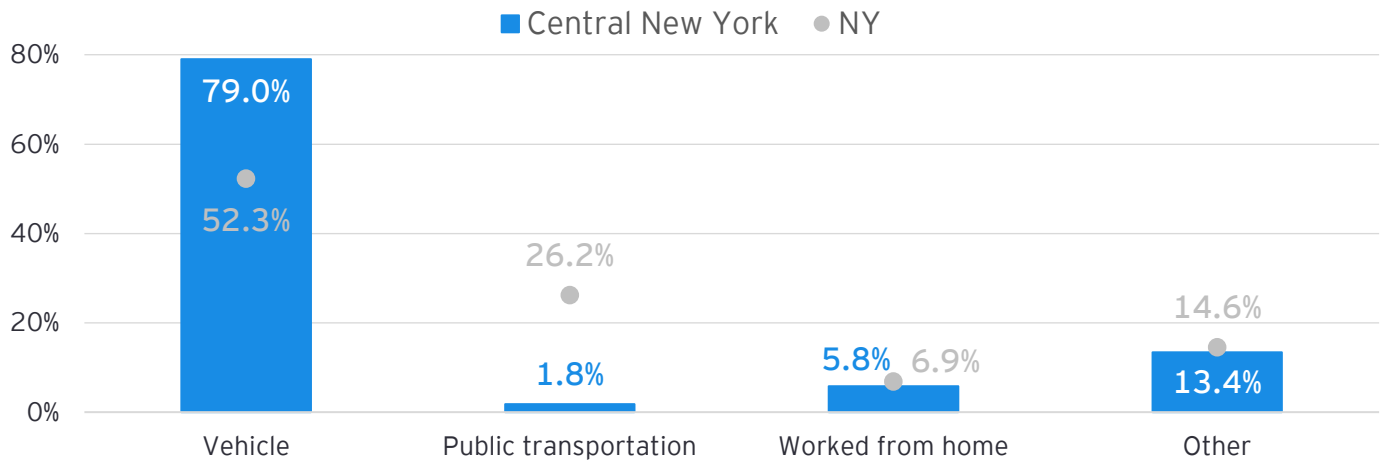
% of population that speaks a language other that English at home, 2015 - 2020



Source:
US Census Bureau

Commuters in Central New York are heavily dependent on personal vehicles.

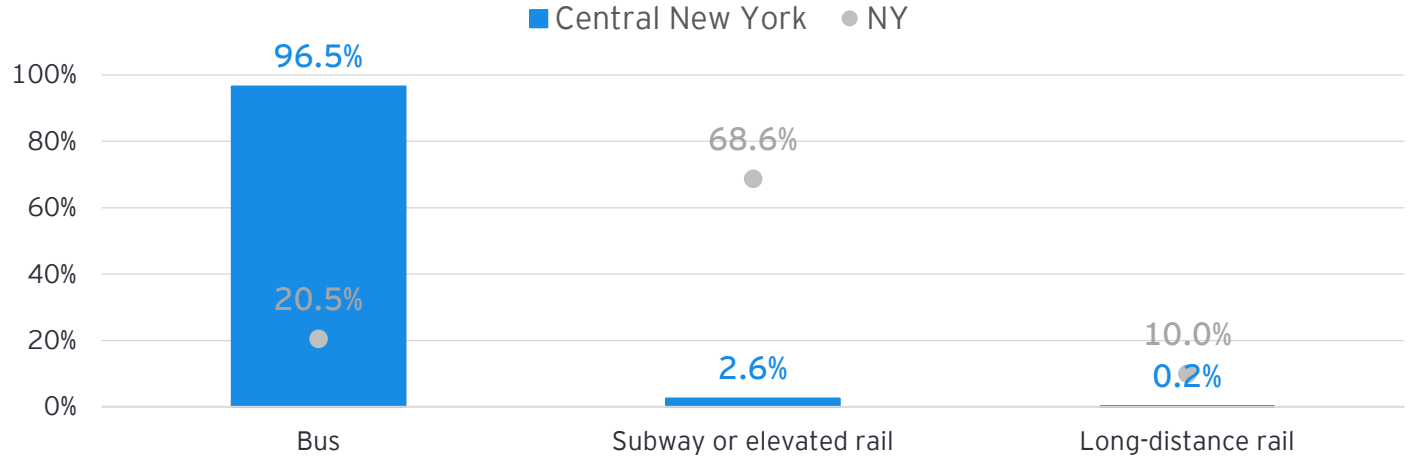
Modes of transportation to work, 2020



Source:
US Census Bureau

Nearly all commuters in Central New York who rely on public transportation use buses.

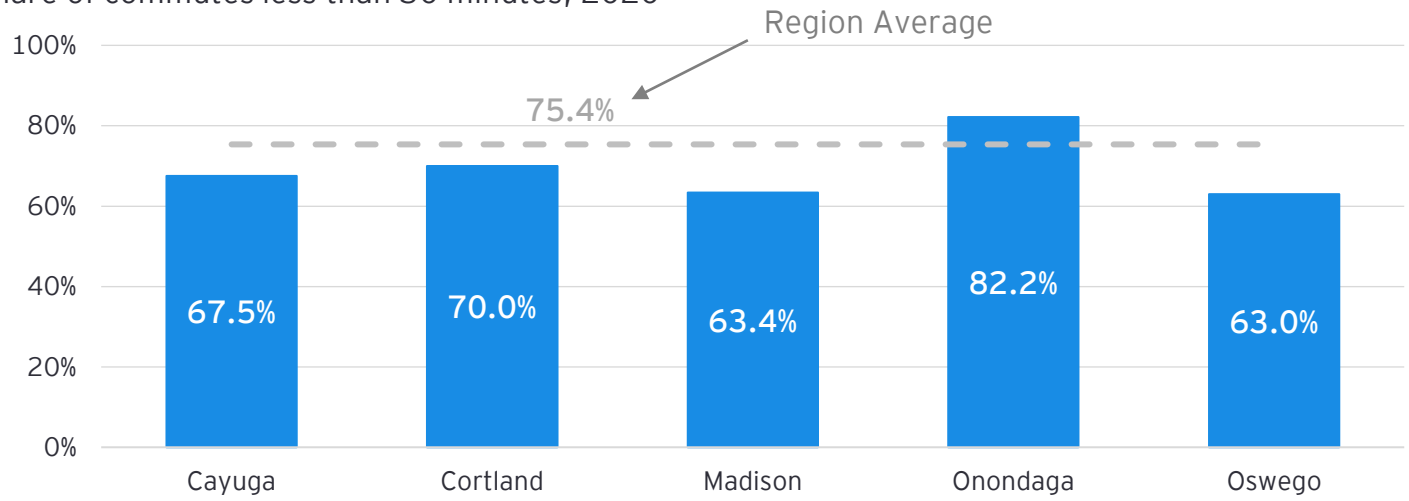
Types of public transportation used as share of total public transportation, 2020



Source:
US Census Bureau

More than half of commuters in Central New York have a commute of 30 minutes or less.

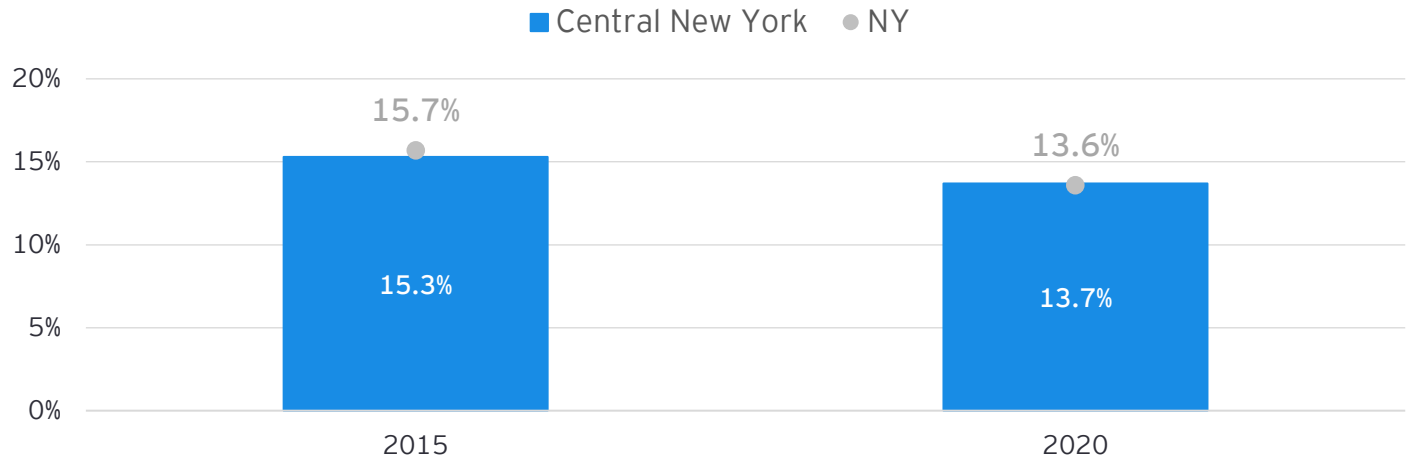
Share of commutes less than 30 minutes, 2020



Source:
US Census Bureau

The percentage of people in Central New York living in poverty has decreased from 2015 to 2020. Poverty levels in the region are similar to statewide averages.

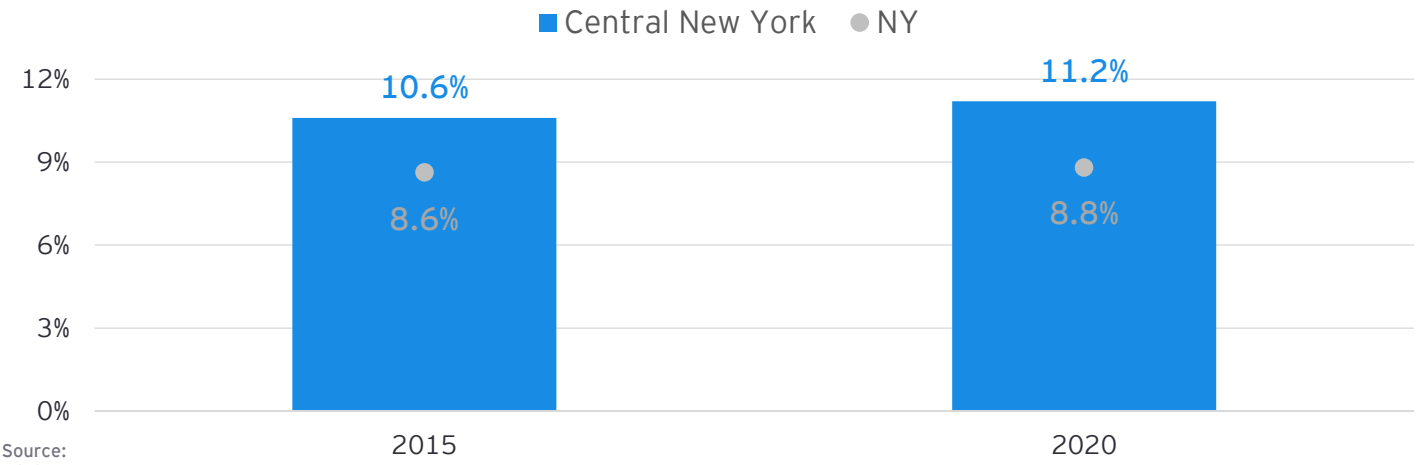
% of residents living in poverty, 2020



Source:
US Census Bureau

More than one in ten Central New York residents have a disability, a higher share than the state average.

Percentage of population with a disability, 2015 - 2020

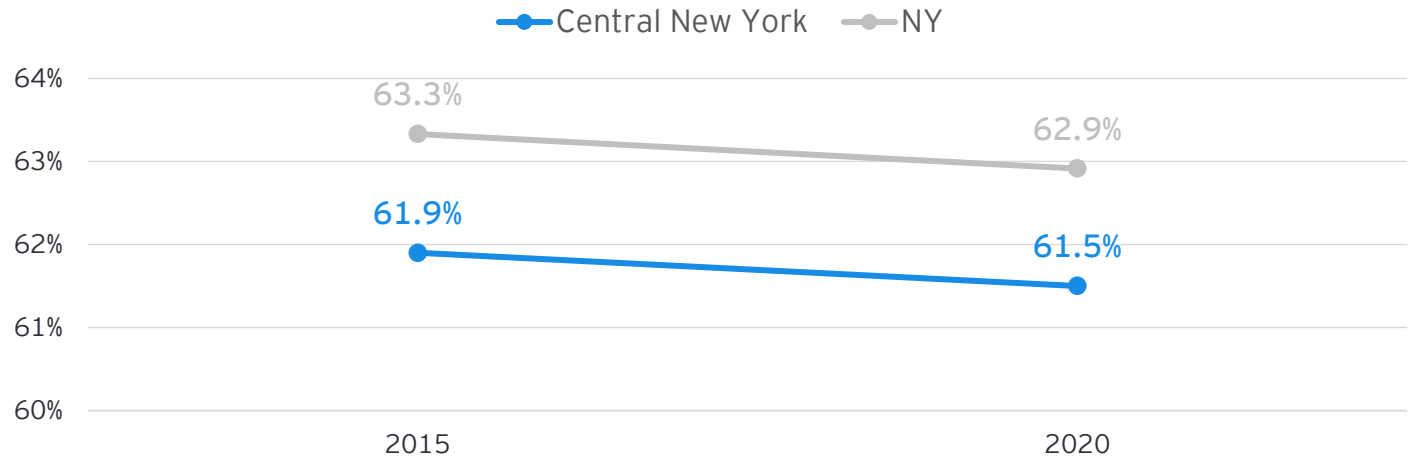


Source:
US Census Bureau

Workforce

Two-thirds of residents of working age (16+) are in the labor force (either working or looking for work). The labor participation rate in Central New York is slightly less than the state average.

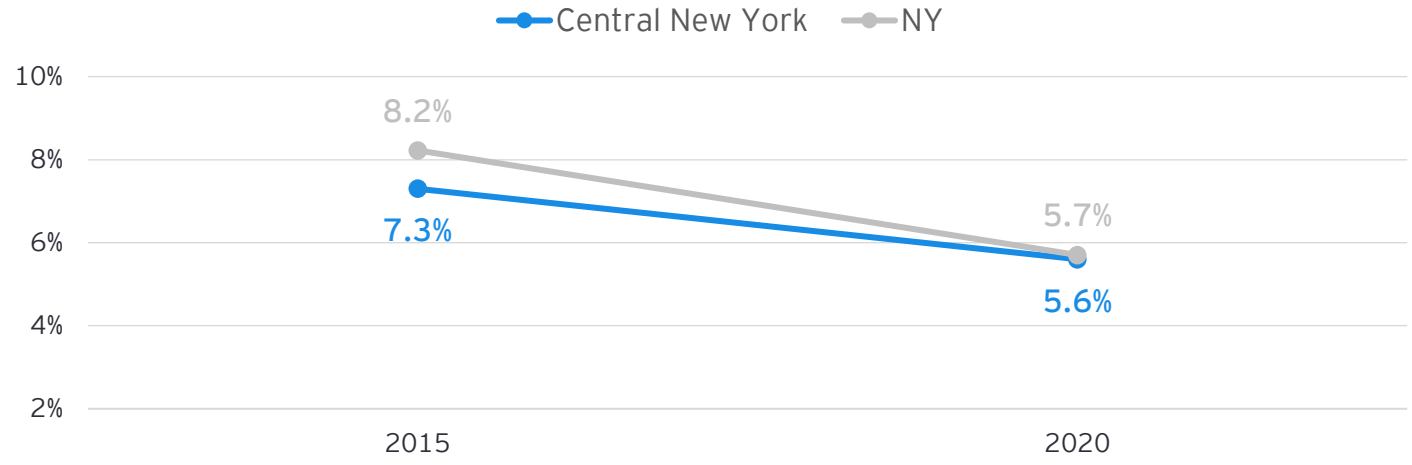
Civilian labor force participation rate 16+ years of age, 2015 - 2020



Source:
US Census Bureau

The unemployment rate in Central New York has decreased from 2015 to 2020 and is on par with the state average.

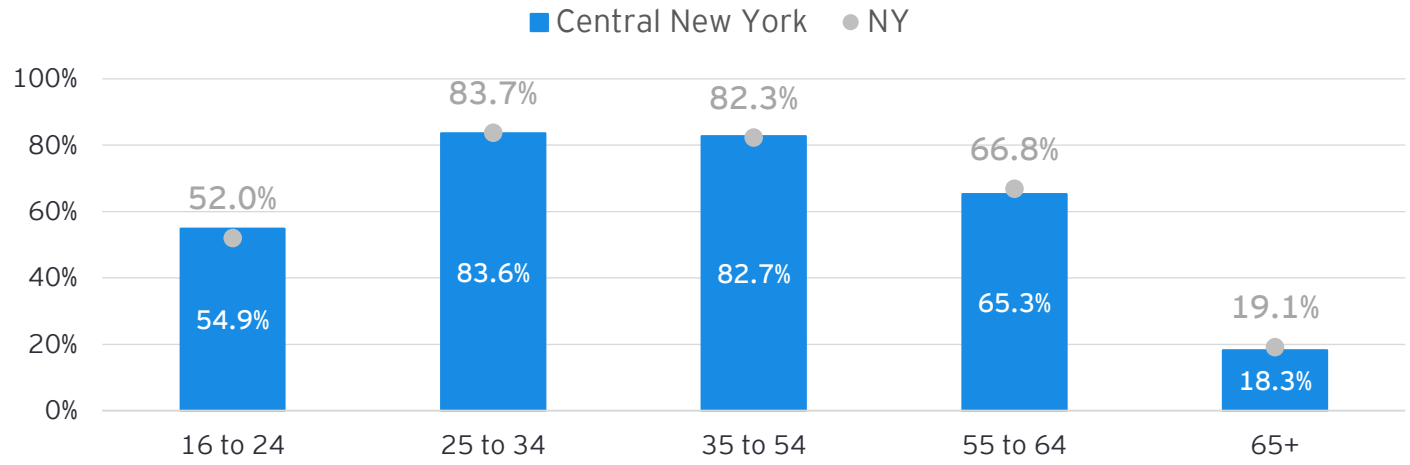
Unemployment rate 16+ years of age, 2015 - 2020



Source:
US Census Bureau

Labor participation rates are highest for people in their prime working age (25-54). Younger residents (16-24) have higher participation rates than the state average.

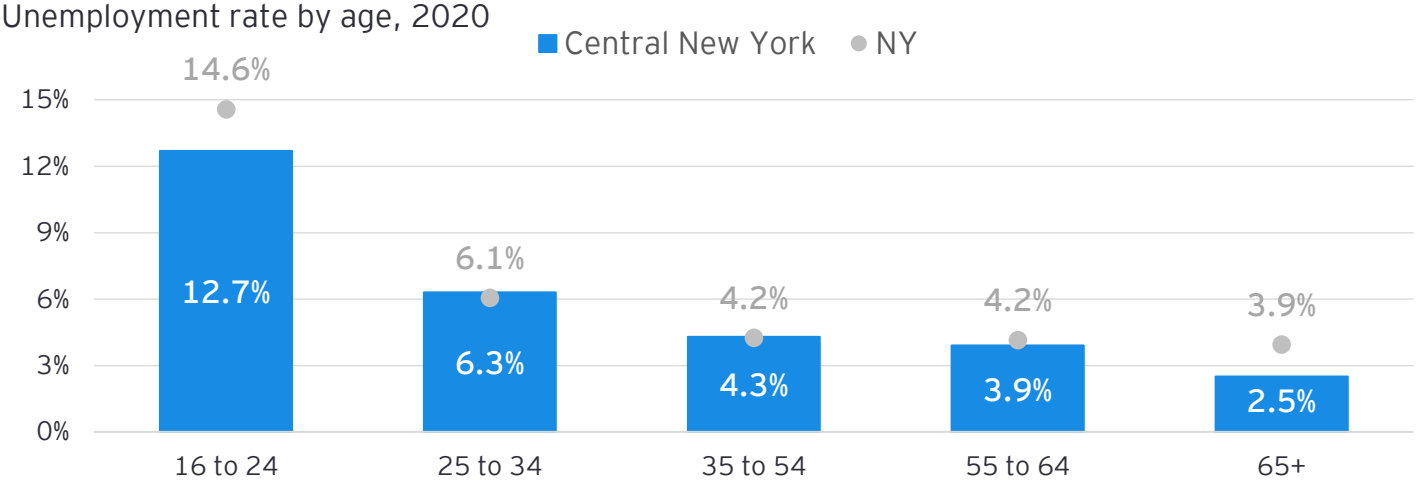
Labor force participation rate by age, 2020



Source:
US Census Bureau

The unemployment rate in Central New York declines as people get older, and unemployment for teenage and college-age populations (15-24) is lower relative to the state average.

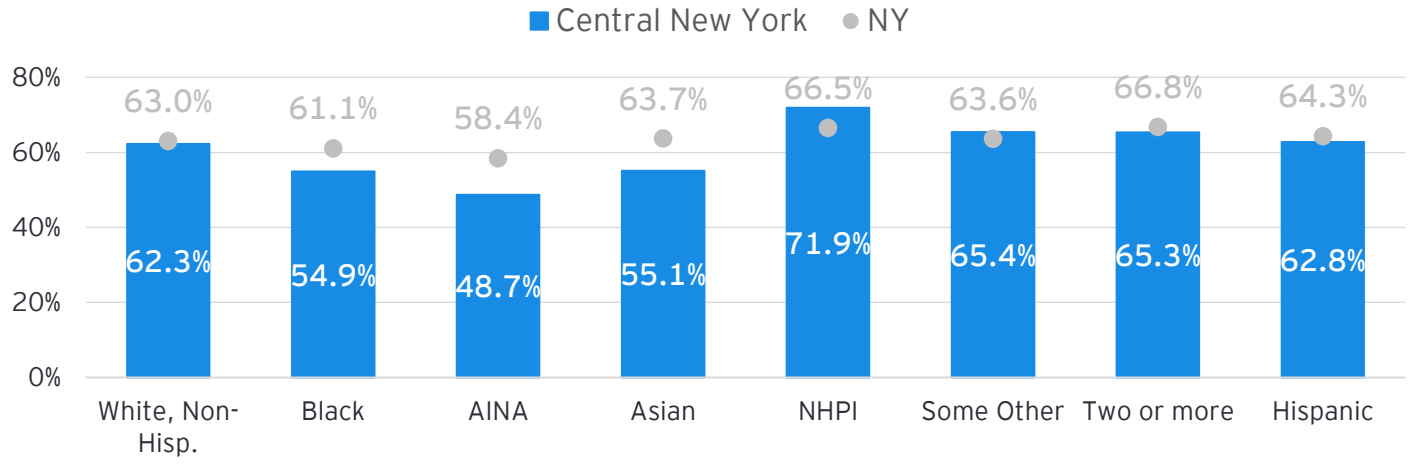
Unemployment rate by age, 2020



Source:
US Census Bureau

Labor participation rates by race and ethnicity are mixed. White and Hispanic populations are on par with the state average, while Black and Asian labor participations is relatively low.

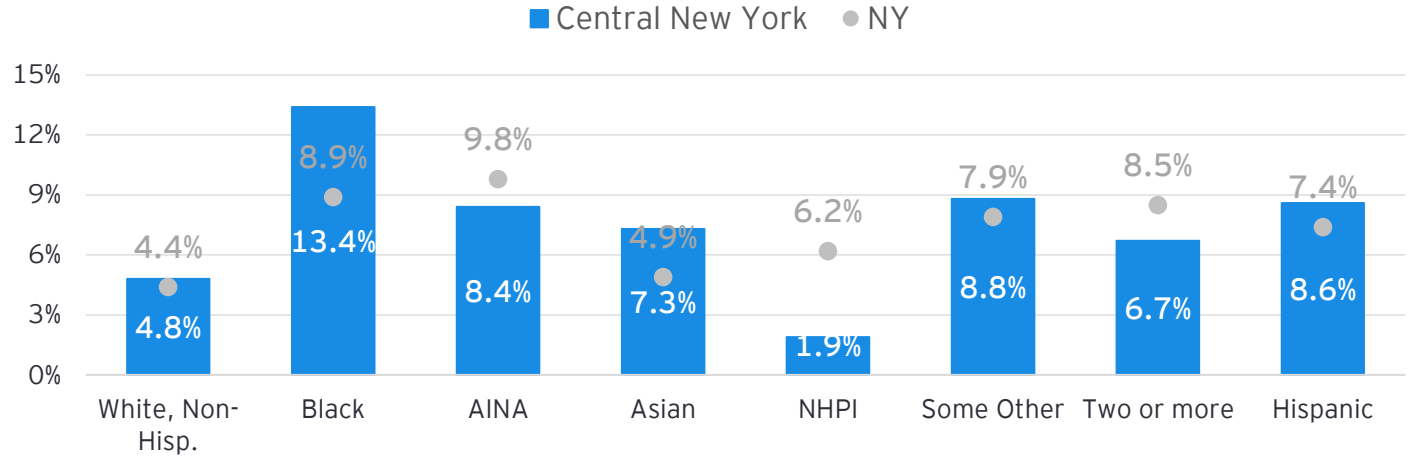
Labor force participation rate by race/ethnicity, 2020



Source:
US Census Bureau

Black and Asian populations in Central New York have much higher unemployment than their peers across the state. Minority unemployment is much higher than White unemployment.

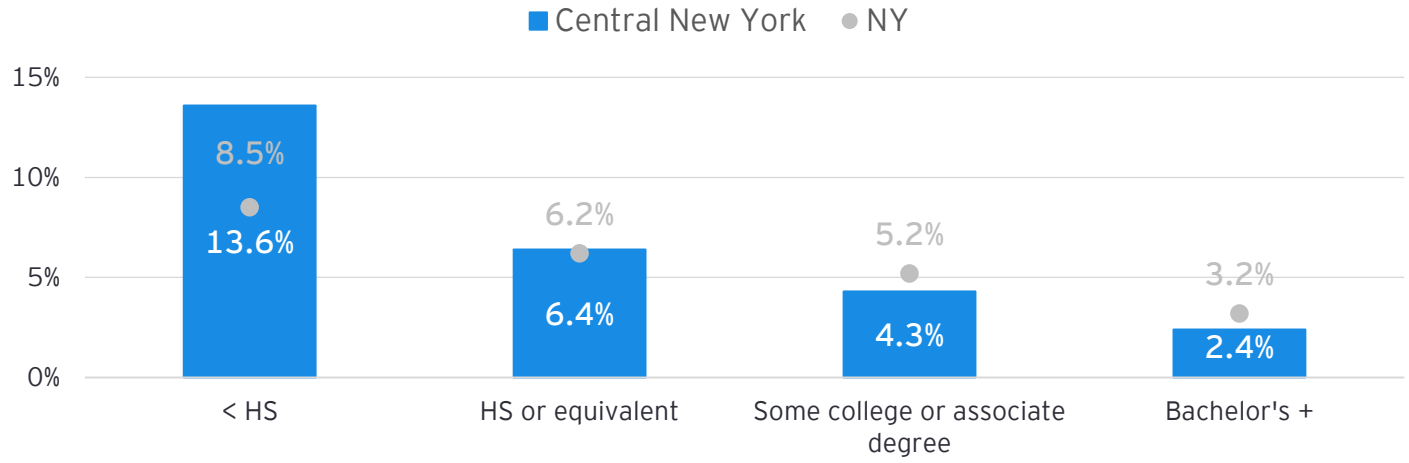
Unemployment rate by race/ethnicity, 2020



Source:
US Census Bureau

Unemployment rates decline with higher education levels. Still, uneducated workers in Central New York have much higher unemployment than the state average.

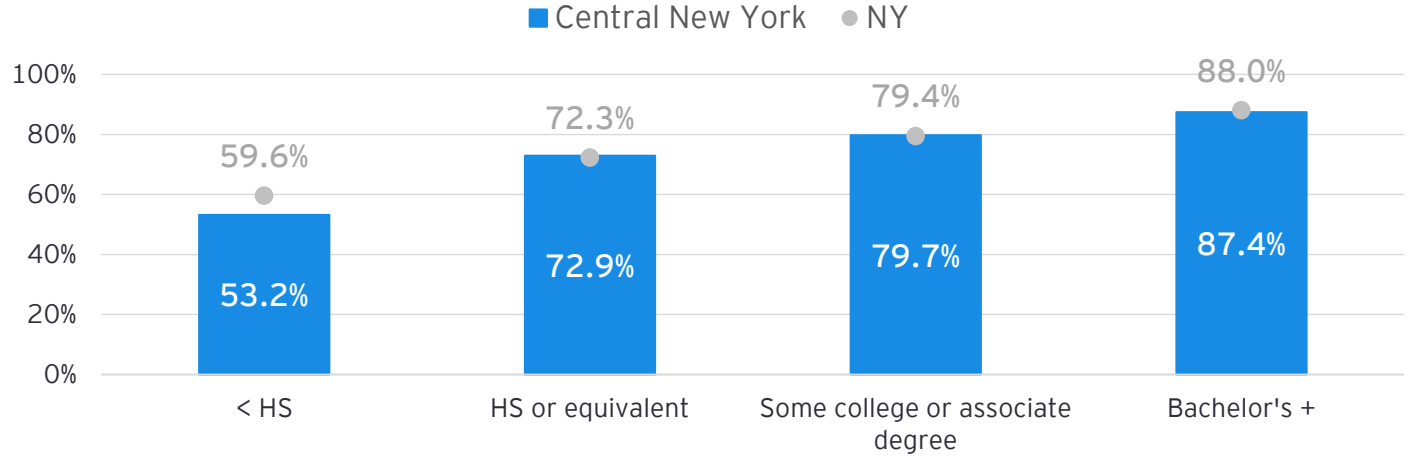
Unemployment rate by educational attainment, 2020



Source:
US Census Bureau

Labor force participation rates increase significantly for workers with more education. Still, less educated people are less likely to be working in Central New York.

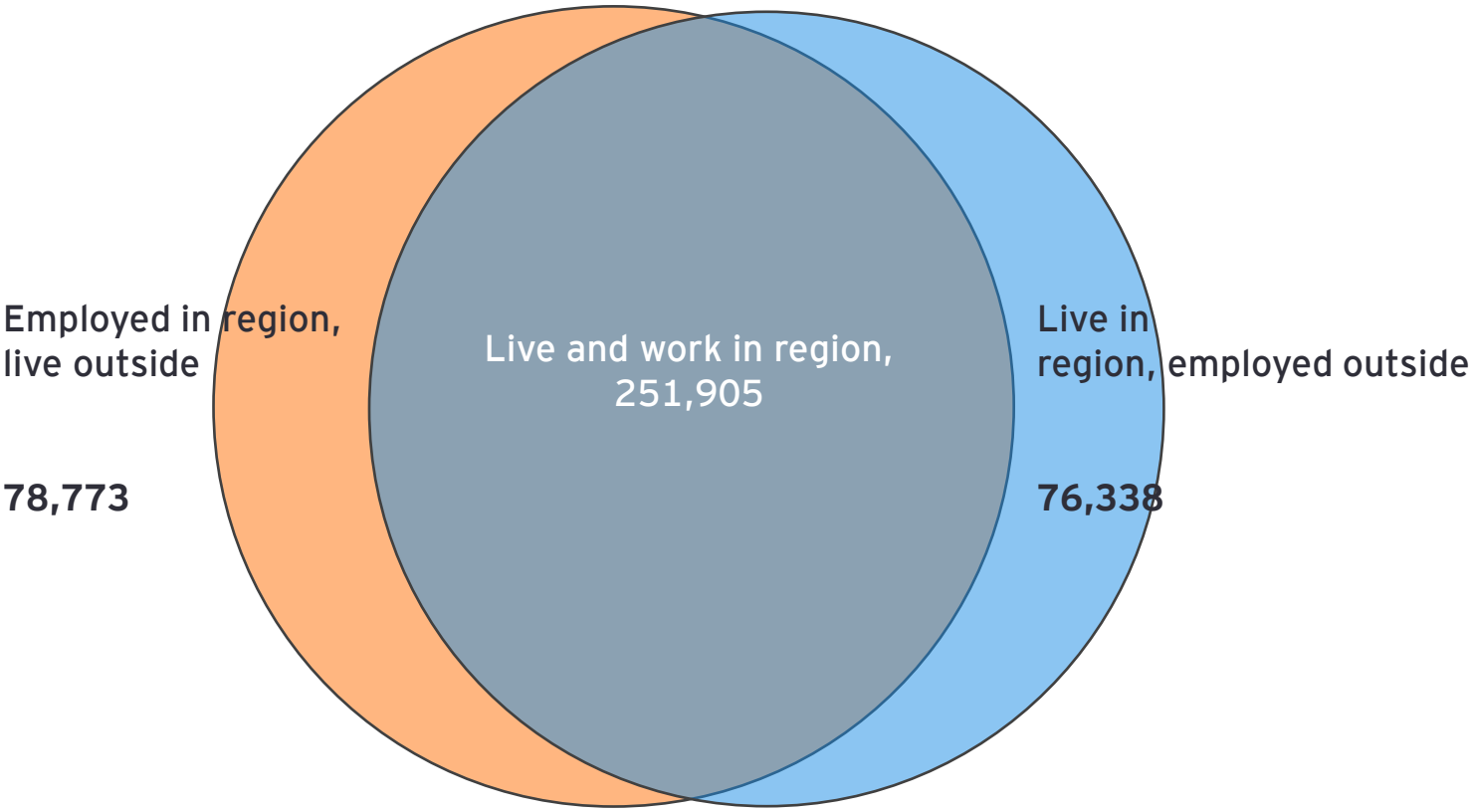
Labor force participation rate by educational attainment (aged 25 to 64), 2020



Source:
US Census Bureau

Twenty-three percent (23%) of workers living in Central New York commute out every day. A slightly larger percentage of workers commute in.

Talent inflow/outflow, 2019

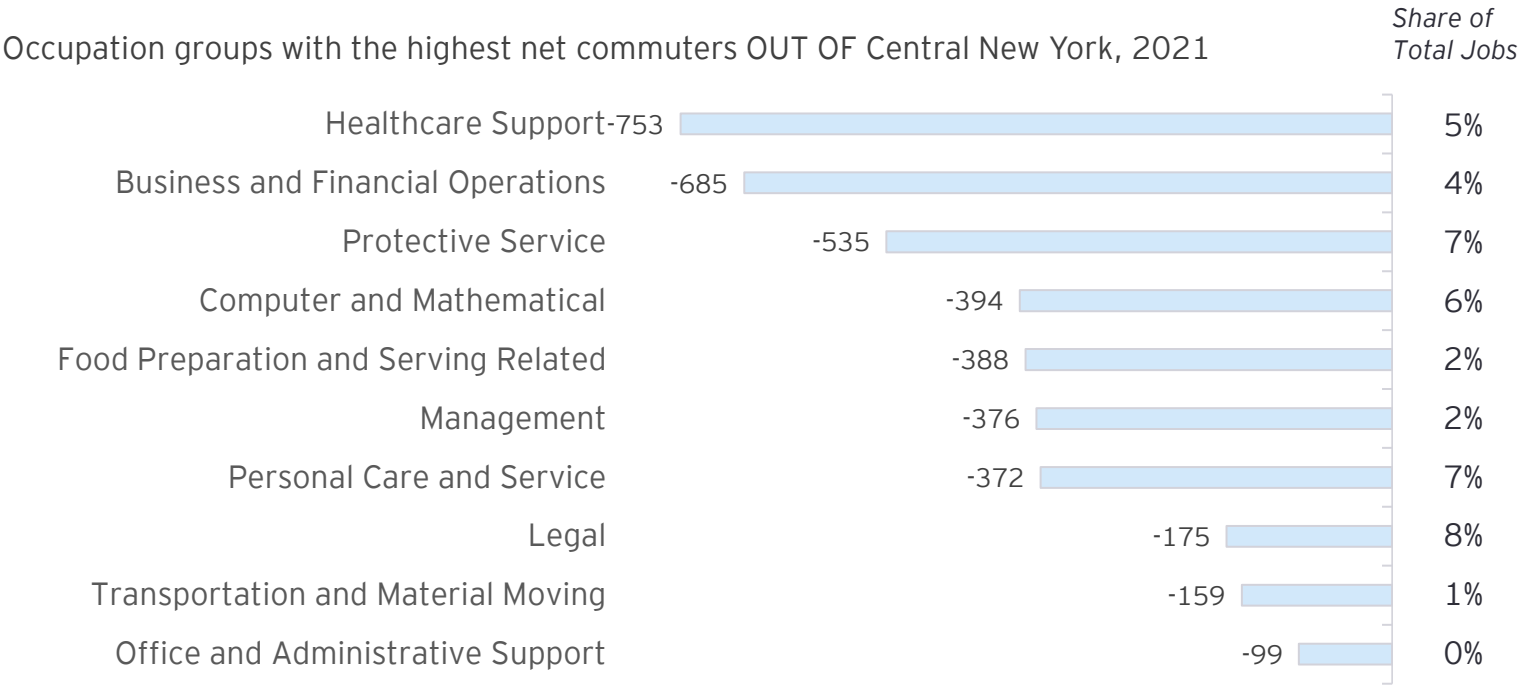


Source:
US Census Bureau

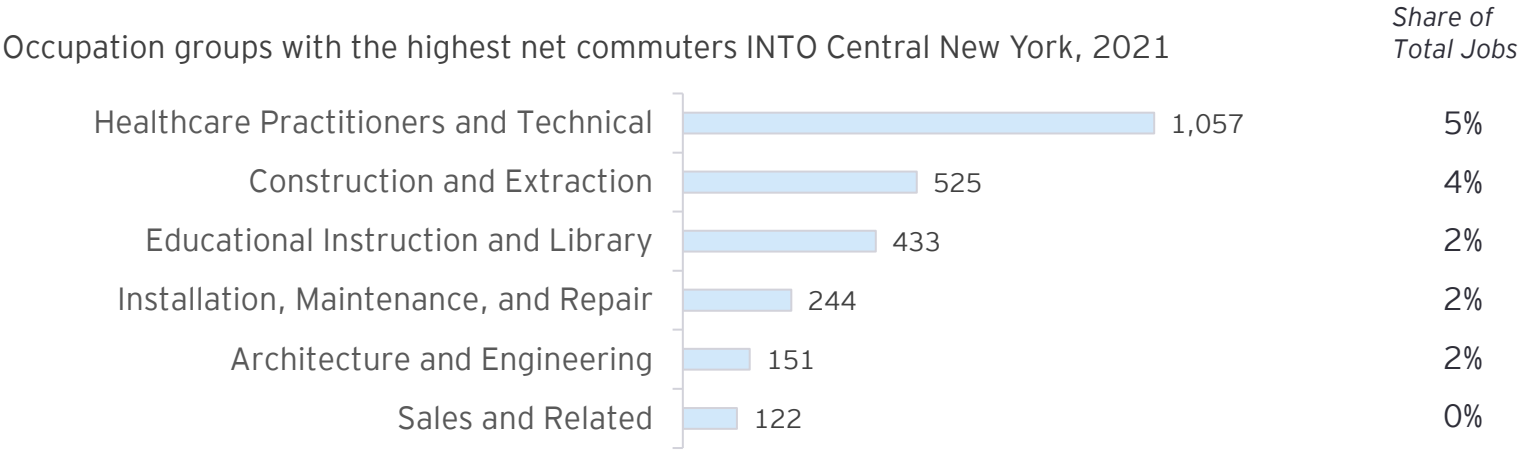
Workforce

Most workers who commute out of Central New York (or work remotely) are Healthcare Support, Business Operations, and Protective Service workers. Most workers who commute in are Healthcare Professionals, Construction workers, and Educators.

Occupation groups with the highest net commuters OUT OF Central New York, 2021



Occupation groups with the highest net commuters INTO Central New York, 2021

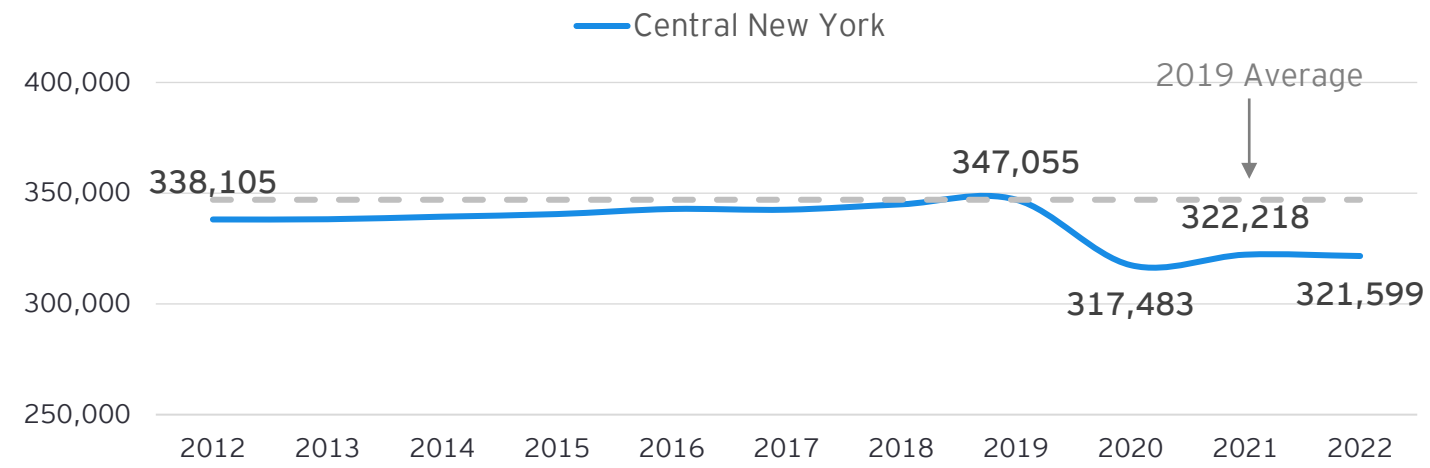


Source:
Lightcast

Workforce

Wage & Salary employment in Central New York has not fully recovered to pre-pandemic levels and remains 7% lower than pre-pandemic levels.

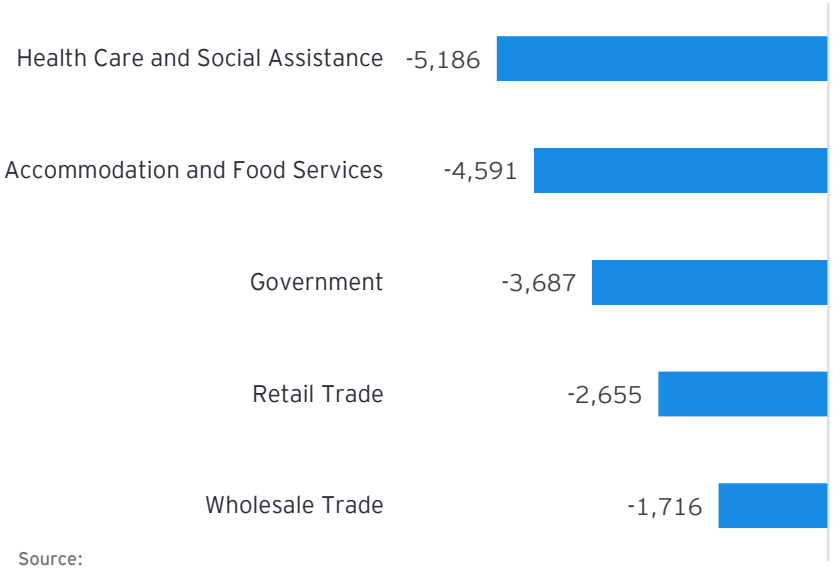
Employment by year, 2012 - 2022



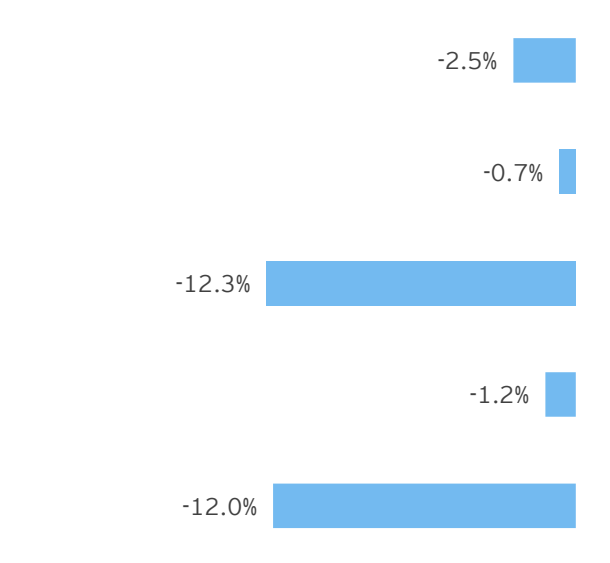
Source: Lightcast

Most jobs lost during the pandemic were in Health Care, Accommodation and Restaurants, and Government. The top 5 declining industries lost a combined 18,000 jobs. Government and Wholesale lost 12% of their job base.

Top industries by net job loss, 2019 - 2022



% Change in jobs, 2019 - 2022



Source: Lightcast

3 Advanced Manufacturing: Industry and occupational analysis

About this chapter

Building off the research started during Phase I, we examine overall trends for each of the target sectors identified for Central New York. We also examine the specific make-up of each target sector's workforce by age, sex, educational attainment, and explore sector wages compared to other industries.

The analysis can help understand the larger economic trends impacting the sector and help to inform sector-specific stakeholder engagement throughout the project. Key metrics in this chapter include:

- Industry employment by year
- Number of businesses by year
- Employment snapshot by NAICS
- Business snapshot by NAICS
- Average annual earnings
- Industry workforce by sex
- Industry workforce by age

Key findings

- Advanced Manufacturing employment has experienced cycles of growth and decline over the last ten years in Central New York and now employs over 15,000 workers. Instruments and Medical Equipment are the largest subsectors, followed by General Machinery, Communications Equipment, and Semiconductors.
- Worker earnings in Central New York Advanced Manufacturing are more than $104,000 and are 30% higher than average of all industries.
- Two-thirds of all Advanced Manufacturing jobs in Central New York require only a high school diploma or less.
- Males and older workers account for a much larger share of employment than seen for all industries.

Advanced Manufacturing

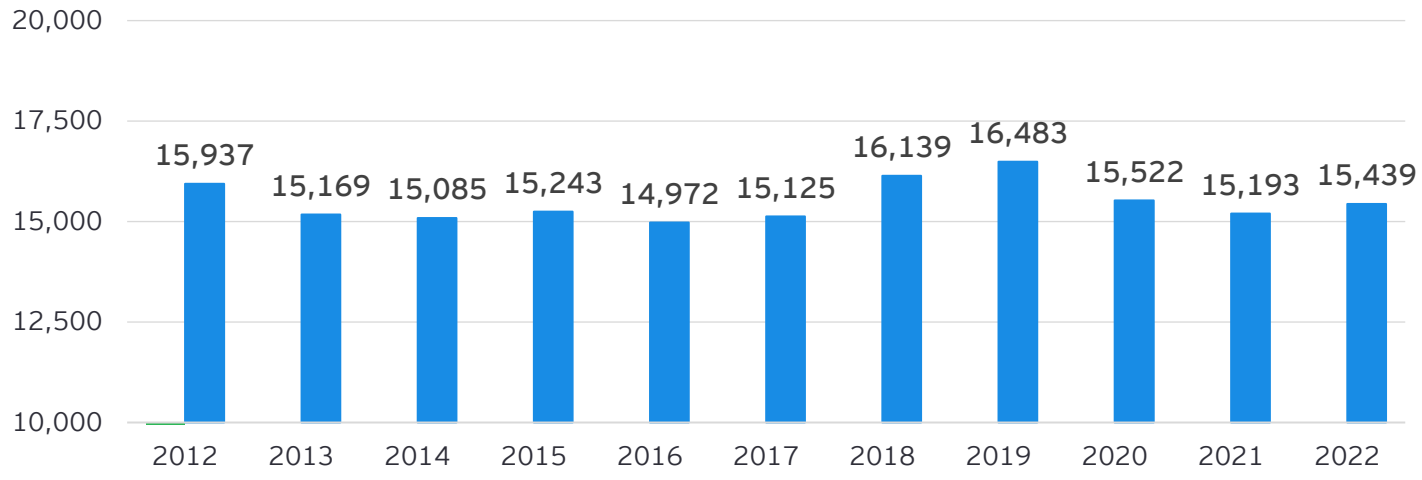
Cluster definitions for Advanced Manufacturing used as part of Phase II analysis for Central New York were provided to EY by New York State Empire Development.

Advanced Manufacturing NAICS definition

NAICS Code	NAICS Description
3241	Petroleum and Coal Products Manufacturing
3251	Basic Chemical Manufacturing
3252	Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing
3253	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing
3254	Pharmaceutical and Medicine Manufacturing
3259	Other Chemical Product and Preparation Manufacturing
3271	Clay Product and Refractory Manufacturing
3279	Other Nonmetallic Mineral Product Manufacturing
3311	Iron and Steel Mills and Ferroalloy Manufacturing
3313	Alumina and Aluminum Production and Processing
3315	Foundries
3331	Agriculture, Construction, and Mining Machinery Manufacturing
3332	Industrial Machinery Manufacturing
3333	Commercial and Service Industry Machinery Manufacturing
3336	Engine, Turbine, and Power Transmission Equipment Manufacturing
3339	Other General Purpose Machinery Manufacturing
3341	Computer and Peripheral Equipment Manufacturing
3342	Communications Equipment Manufacturing
3343	Audio and Video Equipment Manufacturing
3344	Semiconductor and Other Electronic Component Manufacturing
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing
3346	Manufacturing and Reproducing Magnetic and Optical Media
3351	Electric Lighting Equipment Manufacturing
3352	Household Appliance Manufacturing
3353	Electrical Equipment Manufacturing
3359	Other Electrical Equipment and Component Manufacturing
3361	Motor Vehicle Manufacturing
3362	Motor Vehicle Body and Trailer Manufacturing
3363	Motor Vehicle Parts Manufacturing
3364	Aerospace Product and Parts Manufacturing
3365	Railroad Rolling Stock Manufacturing
3366	Ship and Boat Building
3369	Other Transportation Equipment Manufacturing
3391	Medical Equipment and Supplies Manufacturing
3399	Other Miscellaneous Manufacturing

Advanced Manufacturing employment has experienced cycles of growth and decline over the last ten years in Central New York and now employs over 15,000 workers.

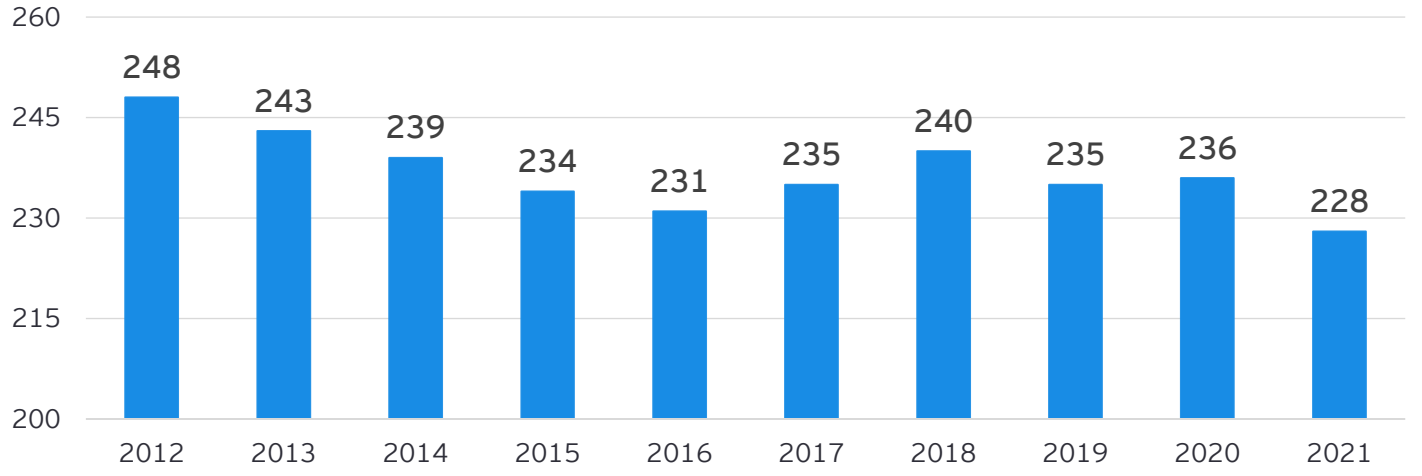
Advanced Manufacturing employment by year, 2012 – 2022



Source: Lightcast

Central New York is home to over 200 Advanced Manufacturers, with some decline in recent years.

Number of payrolled business locations in Advanced Manufacturing, 2012 - 2021



Source: Lightcast

Diverse subsectors comprise Advanced Manufacturing in Central New York. Instruments and Medical Equipment are the largest subsectors, with General Machinery, Communications Equipment, and Semiconductors rounding out the Top 5 subsectors.

Central New York Advanced Manufacturing jobs, 2016 - 2021

NAICS Code	NAICS Description	No. of Jobs (2021)	Growth in No. of Jobs (2016-2021)	% Growth in No. of Jobs (2016-2021)
3345	Navigational, Measuring, Electromedical, and Control...	3,363	488	17.0%
3391	Medical Equipment and Supplies Manufacturing	1,944	150	8.4%
3339	Other General Purpose Machinery Manufacturing	1,171	88	8.1%
3342	Communications Equipment Manufacturing	920	801	669.5%
3344	Semiconductor and Other Electronic Component Manufacturing	904	(136)	-13.1%
3313	Alumina and Aluminum Production and Processing	849	(235)	-21.7%
3363	Motor Vehicle Parts Manufacturing	822	46	5.9%
3271	Clay Product and Refractory Manufacturing	676	110	19.4%
3254	Pharmaceutical and Medicine Manufacturing	640	(52)	-7.6%
3359	Other Electrical Equipment and Component Manufacturing	559	(294)	-34.4%
3399	Other Miscellaneous Manufacturing	544	(14)	-2.6%
3353	Electrical Equipment Manufacturing	367	(275)	-42.8%
3315	Foundries	353	(181)	-33.9%
3251	Basic Chemical Manufacturing	315	66	26.6%
3259	Other Chemical Product and Preparation Manufacturing	262	215	450.0%
3332	Industrial Machinery Manufacturing	260	(131)	-33.6%
3341	Computer and Peripheral Equipment Manufacturing	221	(49)	-18.1%
3279	Other Nonmetallic Mineral Product Manufacturing	218	5	2.4%
3336	Engine, Turbine, and Power Transmission Equip. Manufacturing	120	(9)	-7.2%
3351	Electric Lighting Equipment Manufacturing	111	67	153.5%
3241	Petroleum and Coal Products Manufacturing	105	40	62.7%
3333	Commercial and Service Industry Machinery Manufacturing	91	(2)	-2.4%
3362	Motor Vehicle Body and Trailer Manufacturing	89	21	30.6%
3352	Household Appliance Manufacturing	87	87	--
3311	Iron and Steel Mills and Ferroalloy Manufacturing	82	(118)	-58.9%
3343	Audio and Video Equipment Manufacturing	49	36	266.7%
3331	Agriculture, Construction, and Mining Machinery Manufacturing	44	(406)	-90.1%
3364	Aerospace Product and Parts Manufacturing	16	(31)	-65.5%
3253	Pesticide, Fertilizer, and Other Ag. Chemical Manufacturing	4	(23)	-85.2%
3366	Ship and Boat Building	4	(12)	-74.2%
3252	Resin, Synthetic Rubber, and Artificial and Synthetic Fibers...	0	(29)	-100.0%
3346	Manufacturing and Reproducing Magnetic and Optical Media	0	0	--
3361	Motor Vehicle Manufacturing	0	0	--
3365	Railroad Rolling Stock Manufacturing	0	0	--
3369	Other Transportation Equipment Manufacturing	0	0	--
	Total jobs	**15,193**	**221**	**1.5%**

Source: Lightcast

Miscellaneous manufacturing, Medical equipment and Instruments have the most locations in Central New York. Most business closures have been in Automotive parts and Semiconductors.

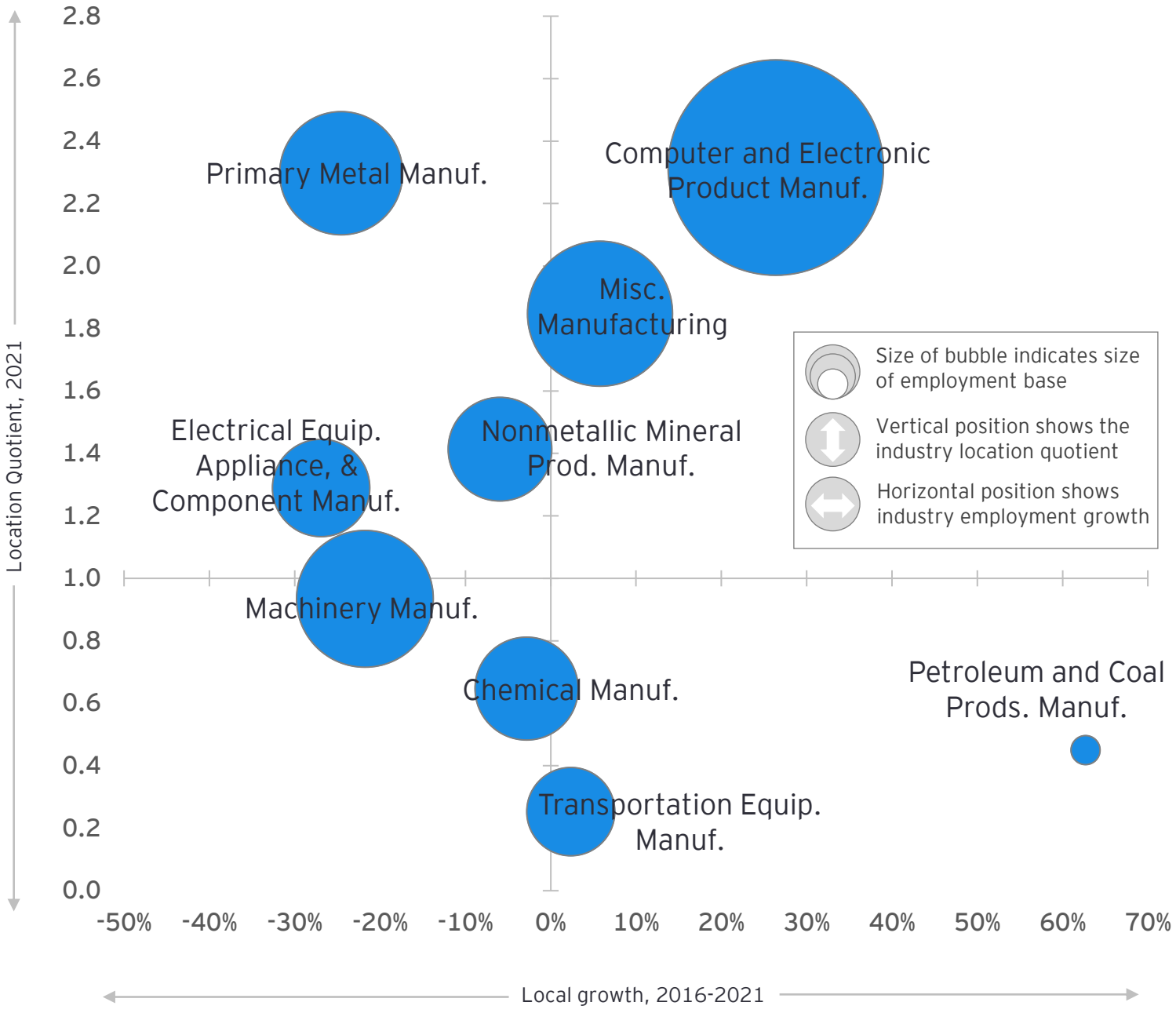
Central New York Advanced Manufacturing businesses, 2016 - 2021

NAICS Code	NAICS Description	No. of Businesses (2021)	Growth in No. of Businesses (2016-2021)	% Growth in No. of Businesses (2016-2021)
3399	Other Miscellaneous Manufacturing	34	2	5.4%
3391	Medical Equipment and Supplies Manufacturing	22	1	4.8%
3345	Navigational, Measuring, Electromedical, and Control...	19	0	0.0%
3344	Semiconductor and Other Electronic Component Manufacturing	18	(2)	-10.3%
3339	Other General Purpose Machinery Manufacturing	14	1	7.7%
3363	Motor Vehicle Parts Manufacturing	12	(5)	-28.4%
3342	Communications Equipment Manufacturing	11	3	37.5%
3353	Electrical Equipment Manufacturing	11	0	2.3%
3359	Other Electrical Equipment and Component Manufacturing	9	0	0.0%
3279	Other Nonmetallic Mineral Product Manufacturing	8	2	33.3%
3254	Pharmaceutical and Medicine Manufacturing	8	3	55.0%
3315	Foundries	7	(3)	-30.0%
3241	Petroleum and Coal Products Manufacturing	7	1	12.5%
3332	Industrial Machinery Manufacturing	6	(1)	-14.3%
3333	Commercial and Service Industry Machinery Manufacturing	5	(1)	-16.7%
3364	Aerospace Product and Parts Manufacturing	5	2	50.0%
3259	Other Chemical Product and Preparation Manufacturing	4	(1)	-20.0%
3331	Agriculture, Construction, and Mining Machinery Manufacturing	4	1	33.3%
3341	Computer and Peripheral Equipment Manufacturing	4	0	0.0%
3251	Basic Chemical Manufacturing	3	(2)	-40.0%
3271	Clay Product and Refractory Manufacturing	3	(2)	-40.0%
3351	Electric Lighting Equipment Manufacturing	3	0	0.0%
3362	Motor Vehicle Body and Trailer Manufacturing	3	(2)	-40.0%
3253	Pesticide, Fertilizer, and Other Ag. Chemical Manufacturing	2	(0)	-11.1%
3313	Alumina and Aluminum Production and Processing	2	1	100.0%
3311	Iron and Steel Mills and Ferroalloy Manufacturing	1	0	0.0%
3336	Engine, Turbine, and Power Transmission Equip. Manufacturing	1	0	0.0%
3343	Audio and Video Equipment Manufacturing	1	0	0.0%
3352	Household Appliance Manufacturing	1	1	--
3366	Ship and Boat Building	1	0	0.0%
3252	Resin, Synthetic Rubber, and Artificial and Synthetic Fibers...	0	(1)	-100.0%
3346	Manufacturing and Reproducing Magnetic and Optical Media	0	0	--
3361	Motor Vehicle Manufacturing	0	0	--
3365	Railroad Rolling Stock Manufacturing	0	0	--
3369	Other Transportation Equipment Manufacturing	0	0	--
	Total number of payrolled business locations	**228**	**-3**	**-1.3%**

Source: Lightcast

The combined Computer & Electronic subclusters (including Semiconductors and Communications) has a high degree of local concentration, many jobs, and is growing in Central New York. Other subclusters like Metals and Misc. Equipment also have high concentrations. Petroleum/Coal products is small but fast-growing.

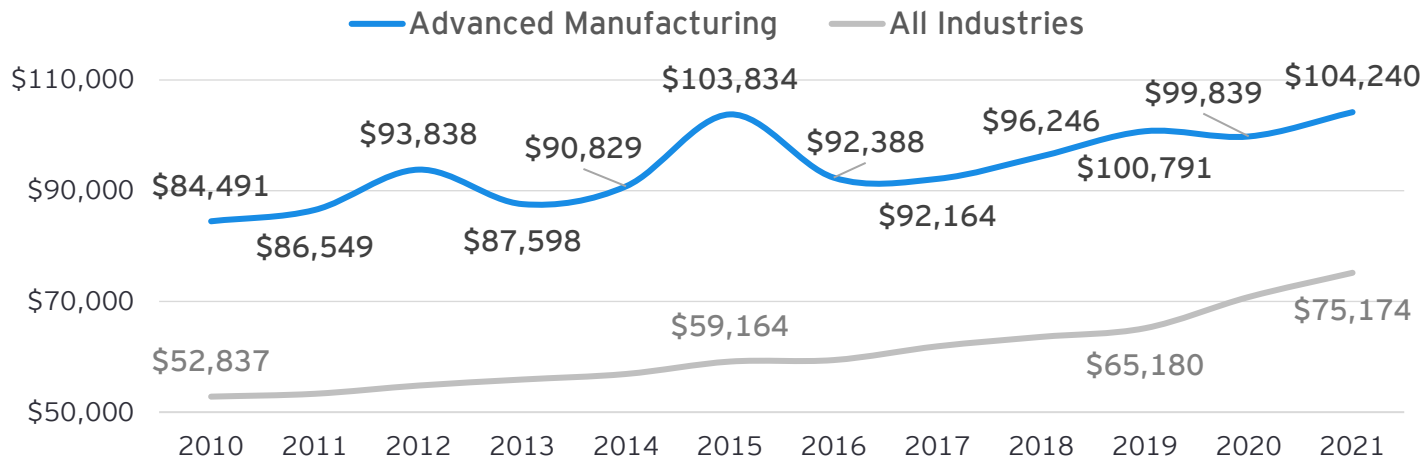
Priority sector performance by jobs, 3-Digit Level NAICS, 2016 and 2021



Source: Lightcast, Empire State Development cluster definitions

Worker earnings in Central New York Advanced Manufacturing are more than $104,000 and are 30% higher than average of all industries.

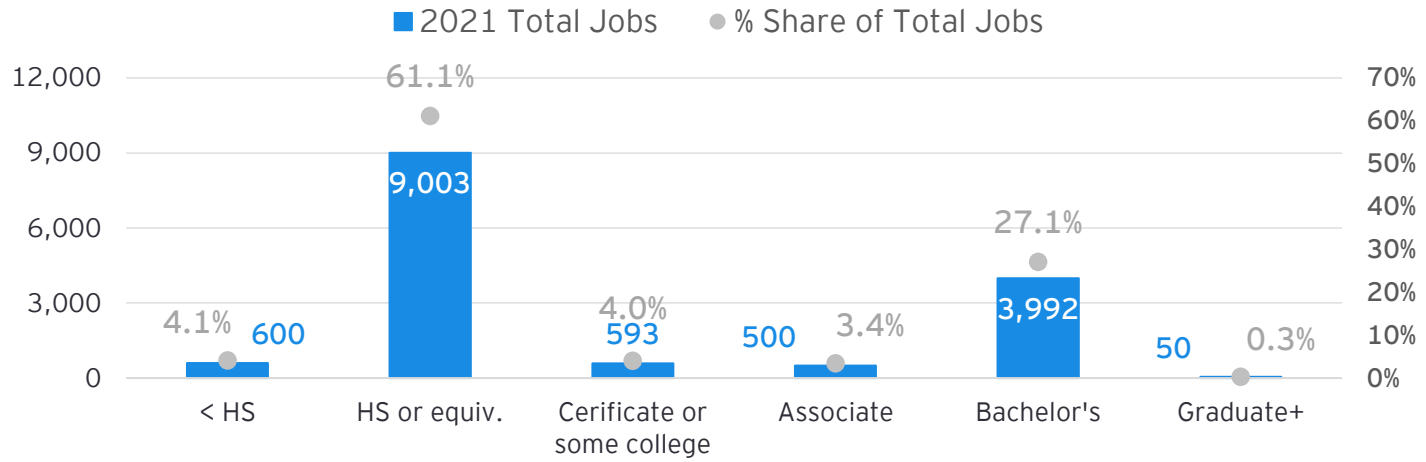
Average annual earnings, 2010 - 2021



Source:
Lightcast

Two-thirds of all Advanced Manufacturing jobs in Central New York require only a high school diploma or less; just 27% require a bachelor's degree or higher.

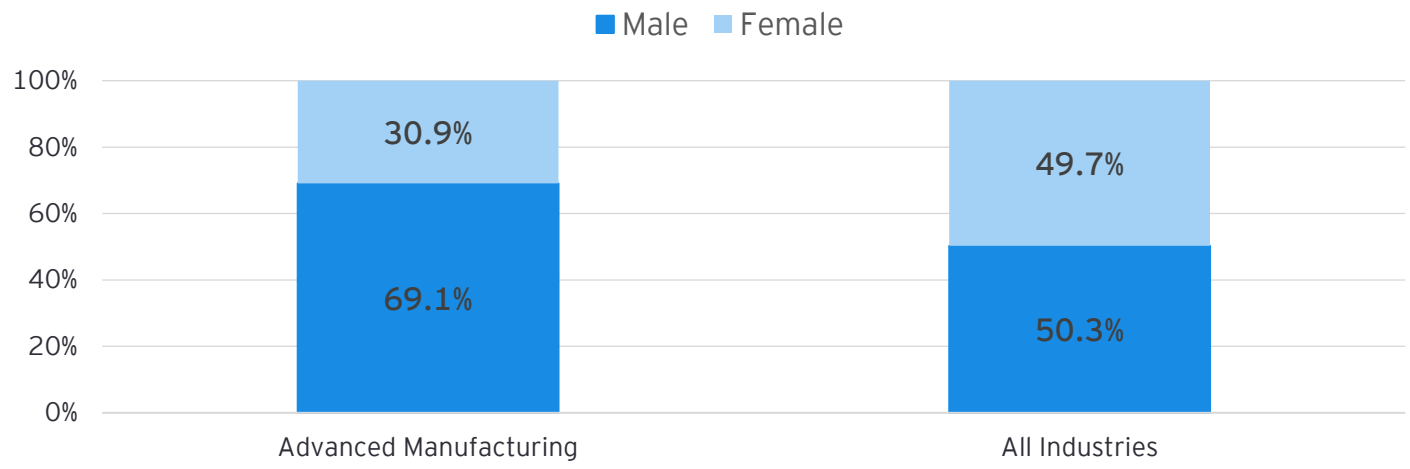
Total jobs by typical entry-level education requirement, Advanced Manufacturing, 2021



Source:
Lightcast

Male workers in Central New York account for more than two-thirds of Advanced Manufacturing workers. Males account for half of workers across all industries.

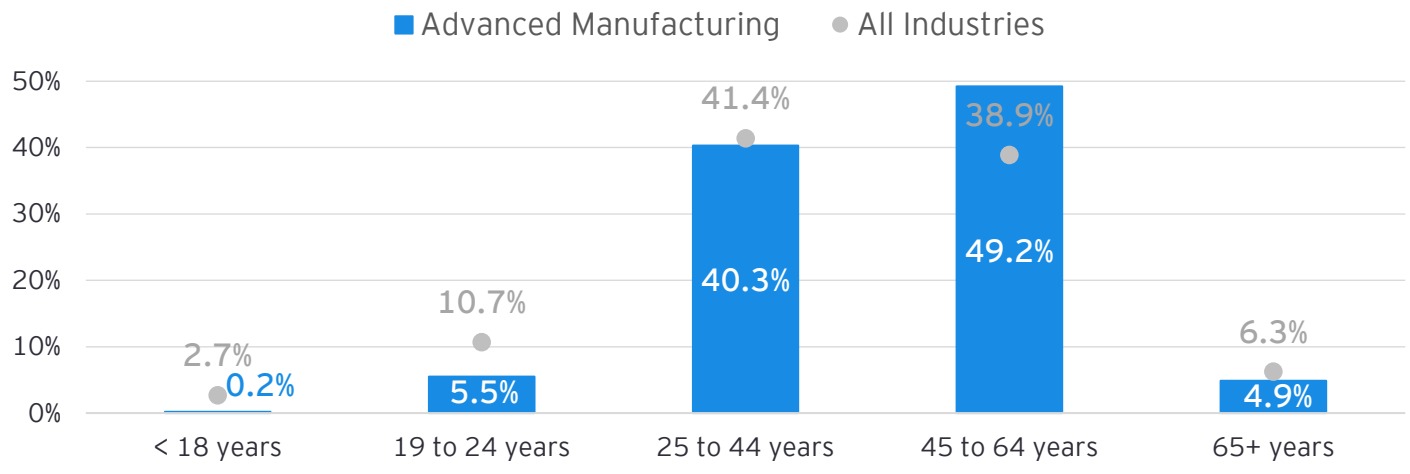
Employment within sector, by sex, 2021



Source:
Lightcast

Older workers (45+) comprise a much higher share of the Advanced Manufacturing workforce in Central New York, which will result in more retirements of workers in coming years.

Employment within sector, by age, 2021



Source:
Lightcast

A large number of Central New York workers in Advanced Manufacturing are in electrical assembly, miscellaneous assembly and inspectors and testers. Bachelor's level demand is found for industrial engineers, managers, and software developers.

Top 25 Advanced Manufacturing occupations with entry-level educational requirements and median hourly earnings, 2021

SOC Code	SOC Description	No. of Jobs (2021)	Median Hourly Earnings (2021)	Typical Entry Level Edu. Req. (2021)
51-2028	Electrical, Electronic, and Electromechanical Assemb...	1,090	$17.33	HS diploma or equiv.
51-2098	Miscellaneous Assemblers and Fabricators	1,086	$17.73	HS diploma or equiv.
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	613	$21.74	HS diploma or equiv.
51-1011	First-Line Supervisors of Prod. and Operating Workers	511	$31.47	HS diploma or equiv.
17-2112	Industrial Engineers	509	$39.81	Bachelor's degree
43-5061	Production, Planning, and Expediting Clerks	463	$23.19	HS diploma or equiv.
11-1021	General and Operations Managers	409	$46.17	Bachelor's degree
41-4012	Sales Representatives, Wholesale and Manufacturing...	320	$29.30	HS diploma or equiv.
49-9071	Maintenance and Repair Workers, General	311	$21.71	HS diploma or equiv.
53-7062	Laborers and Freight, Stock, and Material Movers...	289	$15.07	No formal educational
15-1252	Software Developers	285	$49.19	Bachelor's degree
51-4081	Machine Tool Setters, Op., & Tenders, Metal and Plastic	273	$19.45	HS diploma or equiv.
17-2141	Mechanical Engineers	260	$46.17	Bachelor's degree
51-4041	Machinists	258	$23.10	HS diploma or equiv.
51-9011	Chemical Equipment Operators and Tenders	224	$24.13	HS diploma or equiv.
43-4051	Customer Service Representatives	221	$18.04	HS diploma or equiv.
43-5071	Shipping, Receiving, and Inventory Clerks	219	$17.86	HS diploma or equiv.
53-3032	Heavy and Tractor-Trailer Truck Drivers	218	$23.43	Postsec. nondegree
51-4121	Welders, Cutters, Solderers, and Brazers	217	$20.87	HS diploma or equiv.
49-9041	Industrial Machinery Mechanics	214	$27.40	HS diploma or equiv.
17-2071	Electrical Engineers	213	$47.63	Bachelor's degree
13-1028	Buyers and Purchasing Agents	202	$30.41	Bachelor's degree
51-9111	Packaging and Filling Machine Operators and Tenders	194	$18.10	HS diploma or equiv.
13-2011	Accountants and Auditors	191	$36.74	Bachelor's degree
43-6014	Secretaries and Admin.	177	$18.39	HS diploma or equiv.
	Total jobs in top 25 occupations	**8,965**	**$27.38**	

Source:
Lightcast

For HS graduate positions, most jobs in Advanced Manufacturing are in electrical and miscellaneous assembly, inspection and testing, and supervision of workers.

Top 25 Advanced Manufacturing occupations with entry-level educational requirements of high school diploma or less with median hourly earnings, 2021

SOC Code	SOC Description	No. of Jobs (2021)	Median Hourly Earnings (2021)	Typical Entry Level Edu. Req. (2021)
51-2028	Electrical, Electronic, and Electromechanical...	1,090	$17.33	HS diploma or equiv.
51-2098	Miscellaneous Assemblers and Fabricators	1,086	$17.73	HS diploma or equiv.
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	613	$21.74	HS diploma or equiv.
51-1011	First-Line Supervisors of Prod. and Operating Workers	511	$31.47	HS diploma or equiv.
43-5061	Production, Planning, and Expediting Clerks	463	$23.19	HS diploma or equiv.
41-4012	Sales Reps., Wholesale and Man., Except Tech...	320	$29.30	HS diploma or equiv.
49-9071	Maintenance and Repair Workers, General	311	$21.71	HS diploma or equiv.
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	289	$15.07	No formal educational
51-4081	Multiple Machine Tool Setters, Operators, & Tenders...	273	$19.45	HS diploma or equiv.
51-4041	Machinists	258	$23.10	HS diploma or equiv.
51-9011	Chemical Equipment Operators and Tenders	224	$24.13	HS diploma or equiv.
43-4051	Customer Service Representatives	221	$18.04	HS diploma or equiv.
43-5071	Shipping, Receiving, and Inventory Clerks	219	$17.86	HS diploma or equiv.
51-4121	Welders, Cutters, Solderers, and Brazers	217	$20.87	HS diploma or equiv.
49-9041	Industrial Machinery Mechanics	214	$27.40	HS diploma or equiv.
51-9111	Packaging and Filling Machine Operators and Tenders	194	$18.10	HS diploma or equiv.
43-6014	Secretaries and Admin. Assistants, Except Legal...	177	$18.39	HS diploma or equiv.
43-9061	Office Clerks, General	167	$17.35	HS diploma or equiv.
51-4072	Molding, Coremaking, and Casting Machine Setters...	157	$16.59	HS diploma or equiv.
51-4033	Grinding, Lapping, Polishing, & Buffing Machine...	143	$22.66	HS diploma or equiv.
51-9161	Computer Numerically Controlled Tool Operators	135	$19.28	HS diploma or equiv.
51-2031	Engine and Other Machine Assemblers	98	$19.54	HS diploma or equiv.
43-1011	First-Line Supervisors of Office and Adm. Support...	98	$29.49	HS diploma or equiv.
51-9141	Semiconductor Processing Technicians	97	$15.46	HS diploma or equiv.
51-4031	Cutting, Punching, and Press Machine Setters, Operators...	94	$17.29	HS diploma or equiv.
	Total jobs in top 25 occupations	**7,666**	**$20.90**	

Lightcast

For some college, certificate, or associate positions, most jobs in Advanced Manufacturing are for drivers, accounting clerks, and industrial technicians.

Top 25 Advanced Manufacturing occupations with mid-level educational requirements of certificate through associate degree with median hourly earnings, 2021

SOC Code	SOC Description	No. of Jobs (2021)	Median Hourly Earnings (2021)	Typical Entry Level Edu. Req. (2021)
53-3032	Heavy and Tractor-Trailer Truck Drivers	218	$23.43	Postsec. Nondegree
43-3031	Bookkeeping, Accounting, and Auditing Clerks	129	$22.02	Some college
17-3026	Industrial Engineering Technologists and Technicians	122	$23.93	Associate degree
17-3023	Electrical and Electronic Engineering Technologists...	122	$29.54	Associate degree
51-4111	Tool and Die Makers	80	$28.57	Postsec. Nondegree
15-1232	Computer User Support Specialists	73	$28.51	Some college
49-2094	Electrical and Electronics Repairers, Commercial and...	53	$37.07	Postsec. Nondegree
17-3027	Mechanical Engineering Technologists and Technicians	51	$36.55	Associate degree
19-4031	Chemical Technicians	48	$23.83	Associate degree
17-3013	Mechanical Drafters	36	$35.00	Associate degree
17-3029	Engineering Technologists and Technicians, Except...	30	$28.07	Associate degree
51-9162	Computer Numerically Controlled Tool Programmers	26	$28.68	Postsec. Nondegree
17-3024	Electro-Mechanical and Mechatronics Technologists...	22	$31.10	Associate degree
15-1231	Computer Network Support Specialists	20	$26.86	Associate degree
49-9021	Heating, AC, and Refrigeration Mechanics and Installers	14	$28.74	Postsec. Nondegree
17-3012	Electrical and Electronics Drafters	13	$30.07	Associate degree
17-3028	Calibration Technologists and Technicians	12	$26.97	Associate degree
43-4161	HR Assistants, Except Payroll and Timekeeping	12	$22.33	Associate degree
19-4099	Life, Physical, and Social Science Technicians, All Other	11	$29.70	Associate degree
49-3011	Aircraft Mechanics and Service Technicians	<10	$31.97	Postsec. Nondegree
31-9092	Medical Assistants	<10	$18.16	Postsec. Nondegree
43-4151	Order Clerks	<10	$14.71	Some college
49-3023	Automotive Service Technicians and Mechanics	<10	$22.20	Postsec. Nondegree
49-2095	Electrical and Electronics Repairers, Powerhouse,...	<10	$39.54	Postsec. Nondegree
49-2093	Electrical and Electronics Installers and Repairers...	<10	$28.22	Postsec. Nondegree
	Total jobs in top 25 occupations	**1,092**	**$27.83**	

Source: Lightcast

For bachelor's positions, most jobs in Advanced Manufacturing are for industrial engineers, managers, software developers, and mechanical/electrical engineers.

Top 25 Advanced Manufacturing occupations with high-level educational requirements of bachelor's and above with median hourly earnings, 2021

SOC Code	SOC Description	No. of Jobs (2021)	Median Hourly Earnings (2021)	Typical Entry Level Edu. Req. (2021)
17-2112	Industrial Engineers	509	$39.81	Bachelor's degree
11-1021	General and Operations Managers	409	$46.17	Bachelor's degree
15-1252	Software Developers	285	$49.19	Bachelor's degree
17-2141	Mechanical Engineers	260	$46.17	Bachelor's degree
17-2071	Electrical Engineers	213	$47.63	Bachelor's degree
13-1028	Buyers and Purchasing Agents	202	$30.41	Bachelor's degree
13-2011	Accountants and Auditors	191	$36.74	Bachelor's degree
11-3051	Industrial Production Managers	147	$58.32	Bachelor's degree
11-9041	Architectural and Engineering Managers	137	$77.25	Bachelor's degree
13-1082	Project Management Specialists	128	$44.21	Bachelor's degree
13-1161	Market Research Analysts and Marketing Specialists	122	$31.31	Bachelor's degree
17-2199	Engineers, All Other	92	$48.54	Bachelor's degree
41-4011	Sales Reps, Wholesale and Manufacturing, Technical...	78	$42.81	Bachelor's degree
13-1071	Human Resources Specialists	75	$30.40	Bachelor's degree
11-2022	Sales Managers	71	$65.11	Bachelor's degree
11-3031	Financial Managers	69	$66.48	Bachelor's degree
15-1211	Computer Systems Analysts	67	$47.27	Bachelor's degree
11-3021	Computer and Information Systems Managers	64	$69.51	Bachelor's degree
15-1244	Network and Computer Systems Administrators	59	$37.78	Bachelor's degree
13-1199	Business Operations Specialists, All Other	57	$35.76	Bachelor's degree
13-1151	Training and Development Specialists	55	$29.54	Bachelor's degree
13-2051	Financial and Investment Analysts	50	$38.58	Bachelor's degree
17-2072	Electronics Engineers, Except Computer	47	$48.32	Bachelor's degree
13-1041	Compliance Officers	44	$30.60	Bachelor's degree
11-2021	Marketing Managers	44	$77.72	Bachelor's degree
	Total jobs in top 25 occupations	**3,475**	**$47.02**	

Source:
Lightcast

Advanced Manufacturing | Workforce Gap Analysis

Advanced Manufacturing firms, as shown in tables in the previous pages, require diverse occupations to fill jobs in their facilities. The gap analysis below shows that Central New York underproduces Certificate-level graduates in Advanced Manufacturing and may underproduce at higher education levels if graduates choose not to stay in the region.

The table below shows occupation groups that are matched to degree programs to determine if the supply of graduates is sufficient to meet demand (measured as job openings in a year). A US comparison helps clarify if there is a gap or overproduction of graduates by comparing regional graduates to jobs with the US ratio of graduates to jobs (as shown in the right column below).

Certificate-level positions are significantly underserved by local accredited education programs. **Machinists** are under-produced with just 2 graduates. **Industrial Production Technicians** and **Industrial Machinery Maintenance** have no graduates to serve the 300+ annual job openings. **Welding** graduates are underproduced. On a positive note, **Electronic Repair** graduates are in-balance with demand relative to US levels.

Supply-Demand Gap Conditions
Advanced Manufacturing, Central New York

Gap	Occupation Group	Avg. Educ. Level	Regional 2021 Job Openings	Graduates	Regional Ratio	Supply-demand Ratio versus US
	Electrical & Electronics Repairers	Certificate	82	32	39%	90%
	General Machinist	Certificate	164	2	1%	11%
	Industrial Production Technicians	Certificate	147	0	0%	0%
	Industrial Machinery Maintenance	Certificate	131	0	0%	0%
	Welders	Certificate	77	35	45%	58%
	Chemical Technicians	Associate's	20	0	0%	0%
	Electrical / Electronics Technicians & Di	Associate's	43	34	79%	293%
	Industrial Engineering Technicians	Associate's	32	20	63%	66%
	Accountants & Tax Examiners	Bachelor's	256	321	125%	259%
	Operations Research Analysts	Bachelor's	10	0	0%	0%
	Electrical and Electronics Engineers	Bachelor's	65	70	108%	86%
	Engineering Managers	Bachelor's	35	0	0%	0%
	Industrial Engineers	Bachelor's	76	25	33%	45%
	Mechanical Engineers	Bachelor's	79	109	138%	81%
	Computer Systems & Information Secui	Bachelor's	130	724	557%	614%
	Supply Chain Managers & Analysts	Bachelor's	28	59	211%	549%

Lg Shortage | Shortage | In-Balance | Over-Supply | Lg Over-Supply

Source:
EY analysis of data from Lightcast and US Dept. of Education

Associate's positions fare better, with a relatively high ratio of graduates-to-job-openings in **Industrial Engineering Technician** as well as **Electrical/Electronics Technician & Drafters**. However, no **Chemical Technician** graduates are available to fill 20 estimated job openings per year.

At the Bachelor's level, **Computer Systems** (IT) programs produce 5 times more graduates than job openings, an indication that most graduates will be leaving. Still, **Mechanical Engineering** produces 138% more graduates than regional jobs openings and Electrical Engineering produces 108% more, but will 4 out of 5 graduates leave the region like their IT peers? If so, a shortage in graduates may be more true. Industrial Engineers are underproduced, with just 45% of the US ratio.

More on the Methodology

"Job openings" in 2021 is used to determine demand, which is a combination of workforce turnover and retirement as well as net new jobs. Regional job openings are compared to regional graduate output using an SOC-CIP taxonomy that accounts for education levels. (For example, a Bachelor's in Psychology is not matched with a Psychologist occupation because a Master's or PhD is required.)

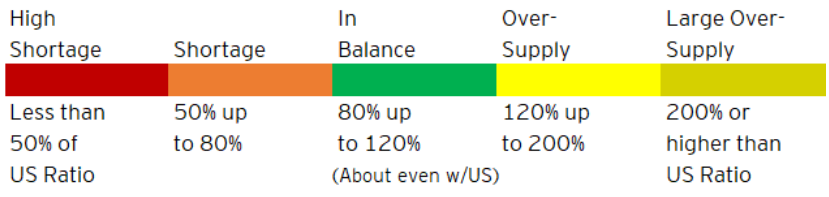
Furthermore, the "supply-demand gap" doesn't hold true as a 1:1 ratio for all occupations. Therefore, we compare the regional ratio to the US ratio to determine if regional graduate output is relatively high or low. This Regional-to-US ratio also compensates for "non-accredited" programs that may exist but aren't in the data (e.g. for-profits that aren't required to report their enrollment data to the government). For example, non-profits may train Home Health Aides which aren't in the data, but the regional comparison of "accredited" graduates to the US does help inform if a local gap may exist.

We determine the regional gap or oversupply in the right column ("ratio vs. US"). If regional graduate output is less than 50% of the US ratio, then we determine there is a large shortage and color the first "Gap" column a dark red. See the legend for colors and their ranges below.

Why does graduate output not always match job openings evenly? Graduates sometimes choose other occupations: Welding may need more graduates since many may finish the program and then choose other jobs, or an Electrical Engineering graduate with a minor in Business may choose a sales but not engineering job. Some positions, like Executive Secretaries or Logistics Clerks are helped by Certificates but many workers learn their skill on the job.

Data is sourced from US Dept. of Education's IPEDS programs (graduate output) and Lightcast/EMSI (job openings by occupation by county). We use a custom taxonomy allocates 1,000 occupation codes and 10,000 graduate program codes (CIP+AwardLevel combinations) into 310 occupation groups. Some degree programs aren't matched if they don't align with jobs in the SOC system or if more education is needed to enter the occupation.

Gap Legend and Ratio Ranges:



4 Smart Systems: Industry and occupational analysis

About this chapter

Building off the research started during Phase I, we examine overall trends for each of the target sectors identified for Central New Yok. We also examine the specific make-up of each target sector's workforce by age, sex, educational attainment, and explore sector wages compared to other industries.

The analysis can help understand the larger economic trends impacting the sector and help to inform sector-specific stakeholder engagement throughout the project. Key metrics in this chapter include:

- Industry employment by year
- Number of businesses by year
- Employment snapshot by NAICS
- Business snapshot by NAICS
- Average annual earnings
- Industry workforce by sex
- Industry workforce by age

Key findings

- Central New York employment in Smart Systems has steadily grown over the past ten years to reach nearly 16,000 workers and over 600 firms.
- The fastest-growing Smart Systems subsector in Central New York is Data Centers, though still small in terms of jobs. Computer and Electronics Manufacturing is the most concentrated and fast-growing.
- Central New York worker earnings in Smart Systems are nearly $105,000 and 30% higher than the average of all industries.
- Workforce education requirements in Smart Systems are split evenly between bachelor's and HS diploma or less.
- Males are heavily concentrated in Smart Systems employment in Central New York. Worker age is evenly split between early and late career.

Smart Systems

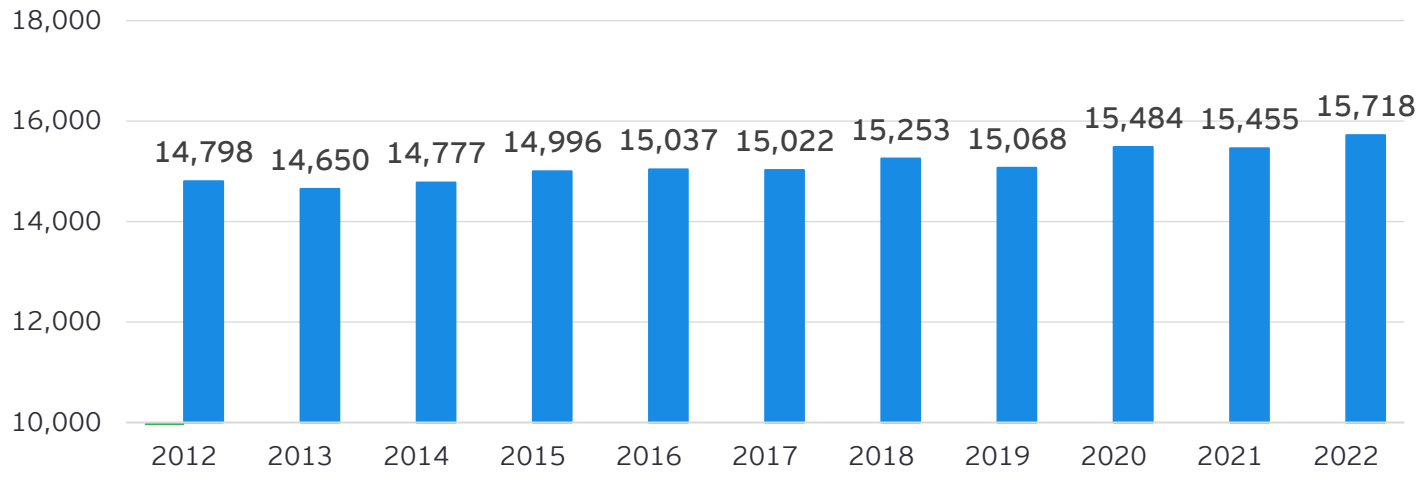
Cluster definitions for Smart Systems used as part of Phase II analysis were curated in collaboration with the Central REDC and based on the definitions provided to EY by New York State Empire Development and support UAV (Aerospace), Electronic, and Information Technology clusters.

Smart Systems NAICS definition

NAICS Code	NAICS Description
326199	All Other Plastics Product Manufacturing
332111	Iron and Steel Forging
332312	Fabricated Structural Metal Manufacturing
332410	Power Boiler and Heat Exchanger Manufacturing
332710	Machine Shops
332721	Precision Turned Product Manufacturing
334111	Electronic Computer Manufacturing
334112	Computer Storage Device Manufacturing
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing
334210	Telephone Apparatus Manufacturing
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing
334290	Other Communications Equipment Manufacturing
334310	Audio and Video Equipment Manufacturing
334412	Bare Printed Circuit Board Manufacturing
334413	Semiconductor and Related Device Manufacturing
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing
334417	Electronic Connector Manufacturing
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
334419	Other Electronic Component Manufacturing
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
336411	Aircraft Manufacturing
336412	Aircraft Engine and Engine Parts Manufacturing
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing
336414	Guided Missile and Space Vehicle Manufacturing
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing
511210	Software Publishers
518210	Data Processing, Hosting, and Related Services
541330	Engineering Services
541511	Custom Computer Programming Services
541512	Computer Systems Design Services
541513	Computer Facilities Management Services
541519	Other Computer Related Services
541713	Research and Development in Nanotechnology
541715	Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology)

Central New York employment in Smart Systems has steadily grown over the past ten years to reach nearly 16,000 workers.

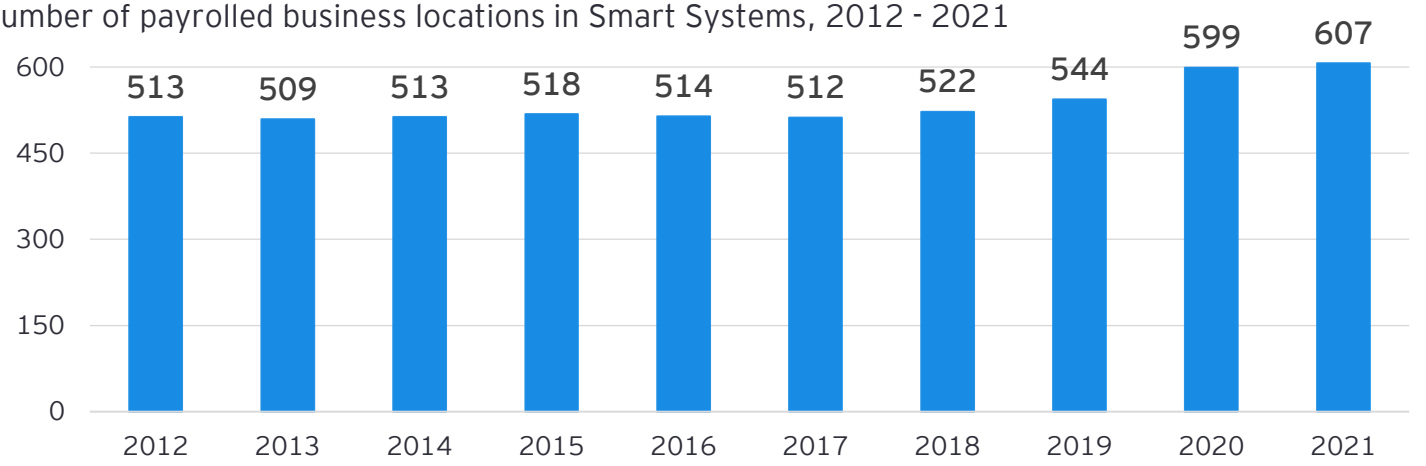
Smart Systems employment by year, 2012 – 2022



Source:
Lightcast

Today, more than 600 Smart Systems business locations are in Central New York.

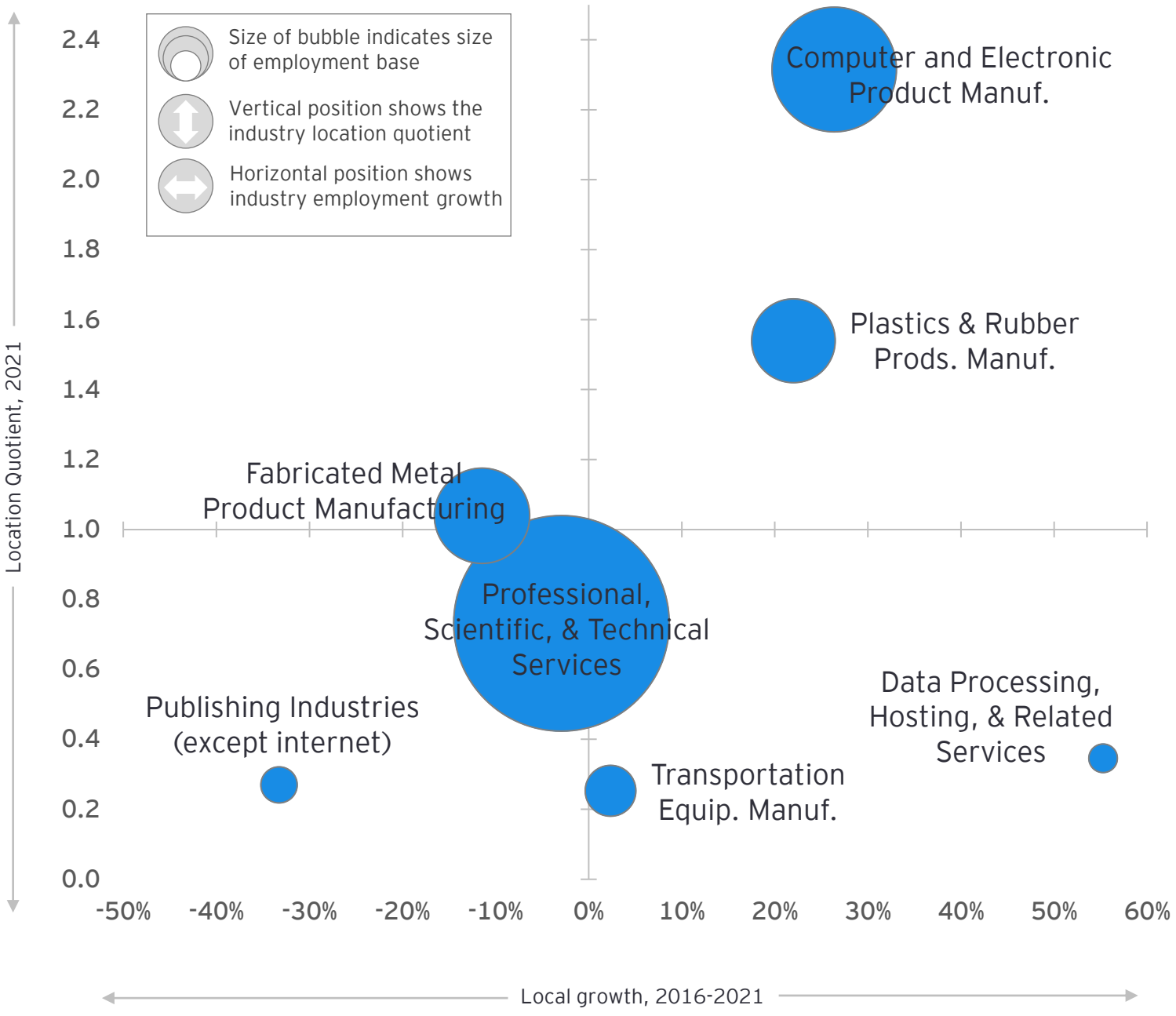
Number of payrolled business locations in Smart Systems, 2012 - 2021



Source: Lightcast

The fastest-growing Smart Systems subsector in Central New York is Data Centers, though still small in terms of jobs. Computer and Electronics Manufacturing is the most concentrated and also fast-growing. Professional/Technical Services employs many workers but is not growing.

Priority sector performance by jobs, 3-Digit Level NAICS, 2016 and 2021



Source: Lightcast, Empire State Development cluster definitions

Navigation Instruments Mftg. employ the most workers (at just 5 locations), Engineering & R&D Services employs many workers. Plastics manufacturing and Machine shops also provide many manufacturing jobs.

Central New York Smart Systems jobs, 2016 - 2021

NAICS Code	NAICS Description	No. of Jobs (2021)	Growth in No. of Jobs (2016-2021)	% Growth in No. of Jobs (2016-2021)
334511	Search, Detection, Navigation, Guidance,...,Instrument Man.	2,744	567	26.0%
541330	Engineering Services	2,711	364	15.5%
326199	All Other Plastics Product Manufacturing	2,223	374	20.2%
541715	R&D in the Physical, Engineering, and Life Sciences...	1,607	-1,068	-39.9%
541512	Computer Systems Design Services	995	-206	-17.2%
332710	Machine Shops	834	-105	-11.2%
334220	Radio and TV Broadcasting & Wireless Comm. Equip. Man.	750	633	543.8%
541511	Custom Computer Programming Services	702	-203	-22.4%
334416	Capacitor, Resistor, Coil, Transformer, & Other Inductor Man.	433	165	61.9%
541513	Computer Facilities Management Services	383	170	79.4%
518210	Data Processing, Hosting, and Related Services	301	107	55.3%
334417	Electronic Connector Manufacturing	298	-414	-58.2%
332721	Precision Turned Product Manufacturing	251	-9	-3.4%
332312	Fabricated Structural Metal Manufacturing	236	52	28.4%
334290	Other Communications Equipment Manufacturing	171	171	--
334515	Instrument Man. for Measuring & Testing Elect. & Elect. Signals	159	159	--
511210	Software Publishers	167	65	64.7%
334112	Computer Storage Device Manufacturing	115	44	61.6%
332410	Power Boiler and Heat Exchanger Manufacturing	127	-132	-50.9%
334419	Other Electronic Component Manufacturing	104	61	138.8%
334118	Computer Terminal & Other Comp. Peripheral Equip. Manuf.	106	-93	-46.7%
332111	Iron and Steel Forging	60	-70	-53.8%
334310	Audio and Video Equipment Manufacturing	49	36	266.7%
541713	Research and Development in Nanotechnology	28	-7	-20.4%
336411	Aircraft Manufacturing	12	12	--
336412	Aircraft Engine and Engine Parts Manufacturing	0	-47	-100.0%
541519	Other Computer Related Services	11	-221	-95.2%
	Total jobs	**15,171**	**406**	**2.7%**

Source:
Lightcast

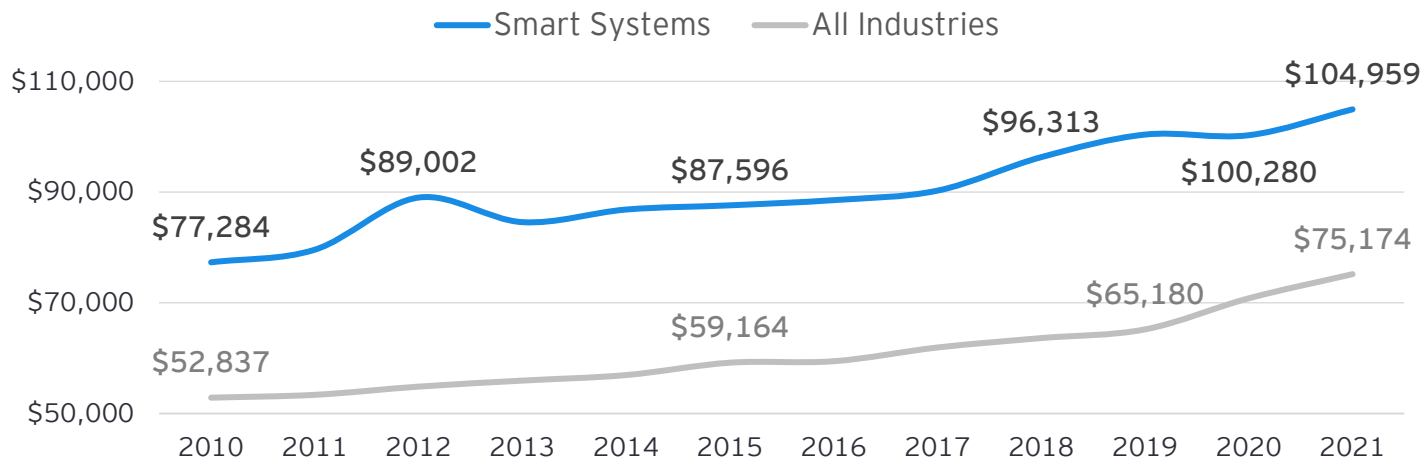
Engineering Services and IT subsectors account for two-thirds of all Smart Systems businesses in Central New York. The subsectors have seen significant new business locations in the past five years.

Central New York Smart Systems businesses, 2016 - 2021

NAICS Code	NAICS Description	No. of Businesses (2021)	Growth in No. of Businesses (2016-2021)	% Growth in No. of Businesses (2016-2021)
541330	Engineering Services	129	12	10.0%
541512	Computer Systems Design Services	127	26	25.2%
541511	Custom Computer Programming Services	117	14	13.6%
332710	Machine Shops	49	-4	-6.7%
511210	Software Publishers	48	35	250.9%
541715	R&D in the Physical, Engineering, and Life Sciences...	24	-6	-19.4%
518210	Data Processing, Hosting, and Related Services	22	5	29.4%
326199	All Other Plastics Product Manufacturing	18	3	16.1%
541513	Computer Facilities Management Services	8	5	166.7%
334220	Radio and TV Broadcasting and Wireless Comm. Equip. Man.	8	3	60.0%
332721	Precision Turned Product Manufacturing	8	2	33.3%
332312	Fabricated Structural Metal Manufacturing	6	--	--
334419	Other Electronic Component Manufacturing	5	1	25.0%
334511	Search, Detection, Navigation, Guidance,...Instrument Man.	5	1	25.0%
334417	Electronic Connector Manufacturing	4	-1	-20.0%
541519	Other Computer Related Services	4	-2	-36.4%
334118	Computer Terminal and Other Peripheral Equip. Manufacturing	3	--	--
334290	Other Communications Equipment Manufacturing	3	--	--
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Man.	3	-1	-25.0%
332410	Power Boiler and Heat Exchanger Manufacturing	3	-1	-25.0%
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing	2	--	--
332111	Iron and Steel Forging	2	--	--
541713	Research and Development in Nanotechnology	2	1	121.8%
336412	Aircraft Engine and Engine Parts Manufacturing	2	1	75.0%
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing	2	--	-12.5%
336411	Aircraft Manufacturing	1	1	--
334310	Audio and Video Equipment Manufacturing	1	--	--
334112	Computer Storage Device Manufacturing	1	--	--
334515	Instrument Man. for Measuring & Testing Elect. & Elect. Signals	1	--	
334412	Bare Printed Circuit Board Manufacturing	1	-1	-33.3%
	Total number of payrolled business locations	**607**	**93**	**18.1%**

Central New York worker earnings in Smart Systems are nearly $105,000 and 30% higher than the average of all industries.

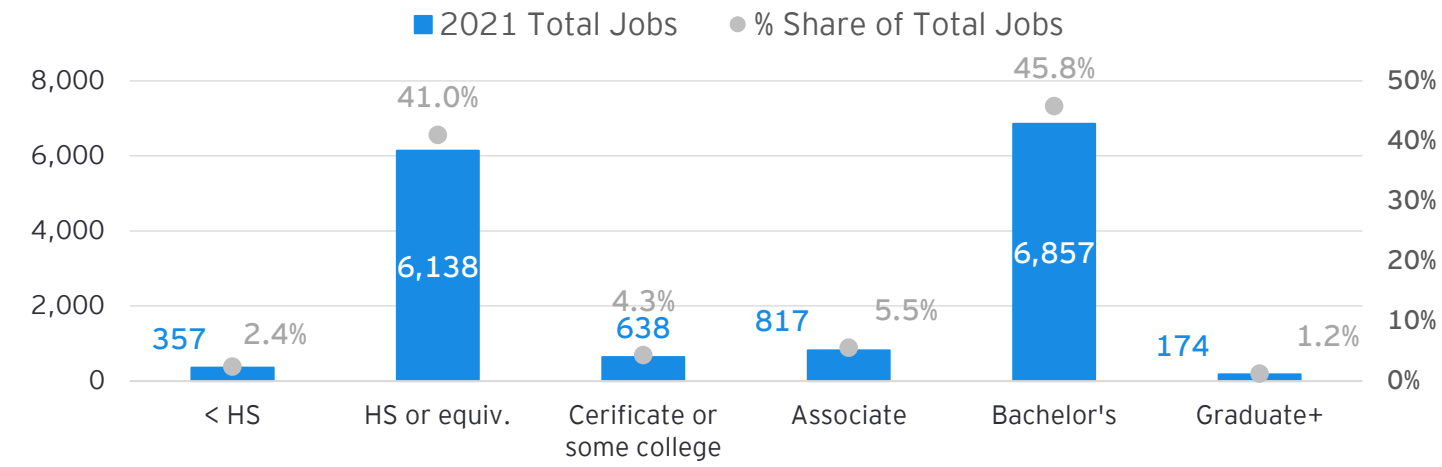
Average annual earnings, 2010 - 2021



Source:
Lightcast

More than 45% of Central New York workers in Smart Systems are in jobs requiring a bachelor's degree or higher. Conversely, 43% of jobs require a HS diploma or less.

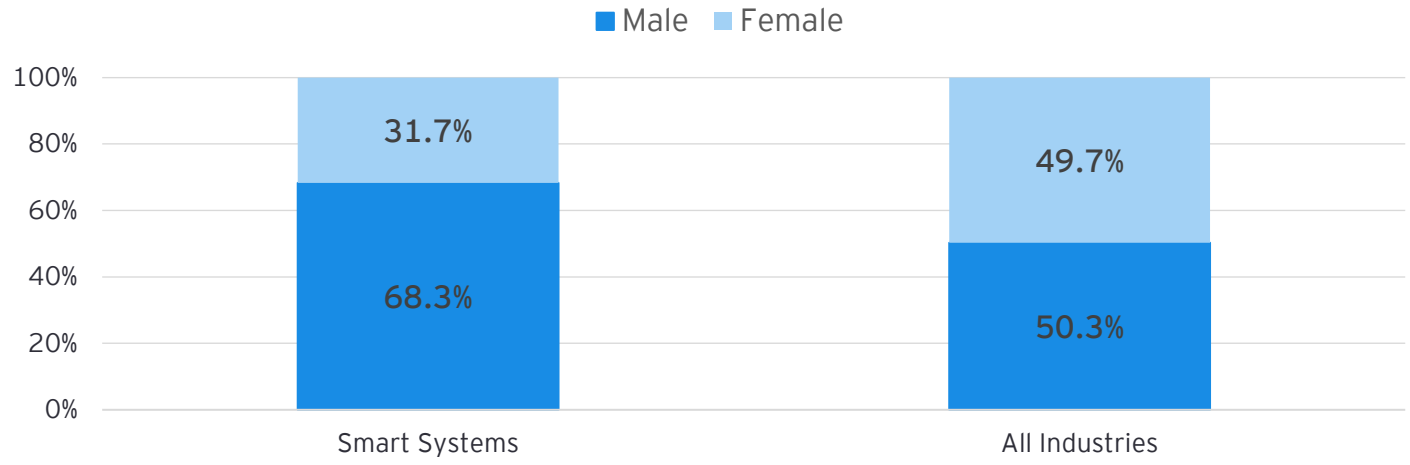
Total jobs by typical entry-level education requirement, Smart Systems, 2021



Source:
Lightcast

Within Smart Systems, males make up most of the overall workforce in Central New York, compared to all industries, which is more evenly distributed.

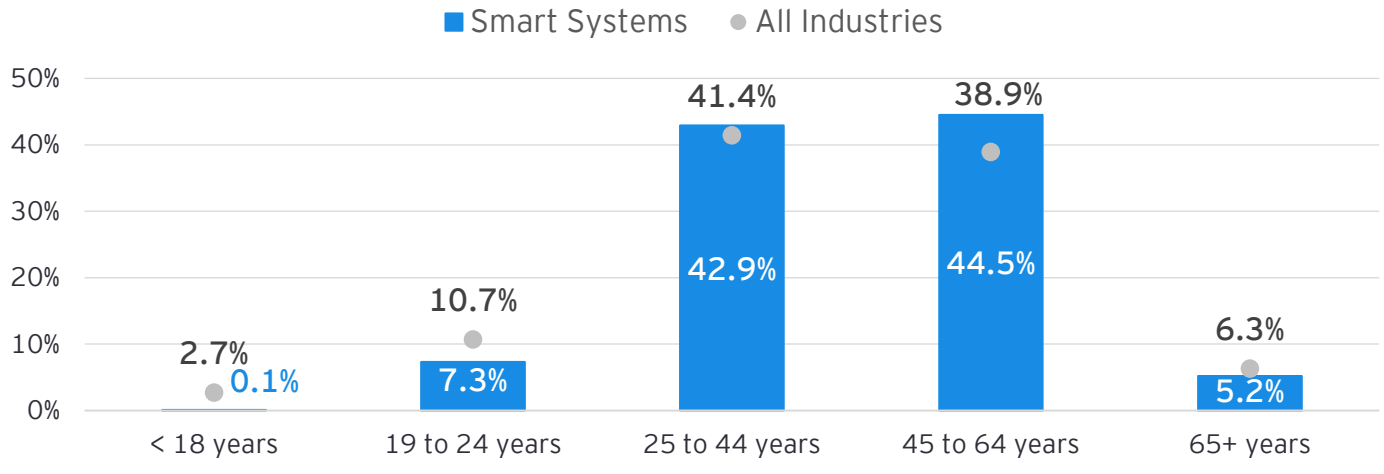
Employment within sector, by sex, 2021



Source:
Lightcast

A large majority of Smart Systems workers are in the 25-64 age range in Central New York. A larger share of workers are in the 45 to 64 range compared to all other industries.

Employment within sector, by age, 2021



Source:
Lightcast

Occupations in Smart Systems are either high-skill or low-skill (HS diploma), with electrical and miscellaneous assemblers leading HS-level jobs and software and engineers leading the bachelor's level jobs. Few jobs are needed at the certificate and associate level.

Top 25 Smart Systems occupations with entry-level educational requirements and median hourly earnings, 2021

SOC Code	SOC Description	No. of Jobs (2021)	Median Hourly Earnings (2021)	Typical Entry Level Edu. Req. (2021)
15-1252	Software Developers	688	$49.19	Bachelor's degree
51-2028	Electrical, Electronic, and Electromechanical...	673	$17.33	HS diploma or equiv.
11-1021	General and Operations Managers	529	$46.17	Bachelor's degree
17-2051	Civil Engineers	482	$40.09	Bachelor's degree
51-2098	Miscellaneous Assemblers and Fabricators	458	$17.73	HS diploma or equiv.
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	442	$21.74	HS diploma or equiv.
17-2112	Industrial Engineers	374	$39.81	Bachelor's degree
51-4072	Molding, Coremaking, and Casting Machine Setters,...	343	$16.59	HS diploma or equiv.
51-4041	Machinists	336	$23.10	HS diploma or equiv.
17-2141	Mechanical Engineers	315	$46.17	Bachelor's degree
51-1011	First-Line Supervisors of Prod. and Operating Workers	313	$31.47	HS diploma or equiv.
13-1082	Project Management Specialists	313	$44.21	Bachelor's degree
15-1232	Computer User Support Specialists	312	$28.51	Some college
43-5061	Production, Planning, and Expediting Clerks	302	$23.19	HS diploma or equiv.
43-6014	Secretaries and Admin. Assistants, Except Legal,...	280	$18.39	HS diploma or equiv.
15-1211	Computer Systems Analysts	269	$47.27	Bachelor's degree
17-2071	Electrical Engineers	253	$47.63	Bachelor's degree
13-2011	Accountants and Auditors	213	$36.74	Bachelor's degree
43-4051	Customer Service Representatives	213	$18.04	HS diploma or equiv.
49-9071	Maintenance and Repair Workers, General	210	$21.71	HS diploma or equiv.
43-9061	Office Clerks, General	201	$17.35	HS diploma or equiv.
11-9041	Architectural and Engineering Managers	196	$77.25	Bachelor's degree
41-3091	Sales Reps. of Services, Ex. Advertising, Insurance,...	195	$29.16	HS diploma or equiv.
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	183	$15.07	No formal education
41-4012	Sales Reps., Wholesale & Man., Except Technical...	177	$29.30	HS diploma or equiv.
	Total jobs in top 25 occupations	**8,270**	**$32.13**	

Source:
Lightcast

For HS-level positions, most jobs in Smart Systems are for assemblers, inspectors, and machinist. Supervisors, clerks, and administrative occupations are also in-demand positions.

Top 25 Smart Systems occupations with entry-level educational requirements of high school diploma or less with median hourly earnings, 2021

SOC Code	SOC Description	No. of Jobs (2021)	Median Hourly Earnings (2021)	Typical Entry Level Edu. Req. (2021)
51-2028	Electrical, Electronic, and Electromechanical...	673	$17.33	HS diploma or equiv.
51-2098	Miscellaneous Assemblers and Fabricators	458	$17.73	HS diploma or equiv.
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	442	$21.74	HS diploma or equiv.
51-4072	Molding, Coremaking, and Casting Machine Setters...	343	$16.59	HS diploma or equiv.
51-4041	Machinists	336	$23.10	HS diploma or equiv.
51-1011	First-Line Supervisors of Production & Op. Workers	313	$31.47	HS diploma or equiv.
43-5061	Production, Planning, and Expediting Clerks	302	$23.19	HS diploma or equiv.
43-6014	Secretaries and Admin. Assistants, Except Legal...	280	$18.39	HS diploma or equiv.
43-4051	Customer Service Representatives	213	$18.04	HS diploma or equiv.
49-9071	Maintenance and Repair Workers, General	210	$21.71	HS diploma or equiv.
43-9061	Office Clerks, General	201	$17.35	HS diploma or equiv.
41-3091	Sales Reps. of Services, Except Advertising, Insurance...	195	$29.16	HS diploma or equiv.
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	183	$15.07	No formal education
41-4012	Sales Reps., Wholesale & Man., Except Technical...	177	$29.30	HS diploma or equiv.
51-4081	Multiple Machine Tool Setters, Operators, & Tenders,...	169	$19.45	HS diploma or equiv.
51-9161	Computer Numerically Controlled Tool Operators	153	$19.28	HS diploma or equiv.
43-5071	Shipping, Receiving, and Inventory Clerks	150	$17.86	HS diploma or equiv.
43-6011	Exec. Secretaries and Exec. Administrative Assistants	137	$32.11	HS diploma or equiv.
49-9041	Industrial Machinery Mechanics	106	$27.40	HS diploma or equiv.
43-1011	First-Line Supervisors of Office & Admin. Support...	102	$29.49	HS diploma or equiv.
51-9141	Semiconductor Processing Technicians	96	$15.46	HS diploma or equiv.
51-4121	Welders, Cutters, Solderers, and Brazers	95	$20.87	HS diploma or equiv.
51-4033	Grinding, Lapping, Polishing, & Buffing Machine Tool...	83	$22.66	HS diploma or equiv.
47-4011	Construction and Building Inspectors	79	$30.41	HS diploma or equiv.
51-9111	Packaging and Filling Machine Operators and Tenders	64	$18.10	HS diploma or equiv.
	Total jobs in top 25 occupations	**5,560**	**$22.13**	

Source: Lightcast

For some college, certificate or associate level positions, most jobs in Smart Systems are for support roles and technicians. Most in-demand positions require a certificate of associate degree with few occupations available for those with some college.

Top 25 Smart Systems occupations with mid-level educational requirements of certificate through associate degree with median hourly earnings, 2021

SOC Code	SOC Description	No. of Jobs (2021)	Median Hourly Earnings (2021)	Typical Entry Level Edu. Req. (2021)
15-1232	Computer User Support Specialists	312	$28.57	Postsec. Nondegree
43-3031	Bookkeeping, Accounting, and Auditing Clerks	152	$29.70	Associate degree
17-3011	Architectural and Civil Drafters	132	$28.07	Associate degree
17-3023	Electrical and Electronic Engineering Technologists...	129	$29.15	Associate degree
17-3026	Industrial Engineering Technologists and Technicians	87	$23.83	Associate degree
15-1231	Computer Network Support Specialists	84	$28.68	Postsec. Nondegree
17-3027	Mechanical Engineering Technologists and Technicians	73	$30.07	Associate degree
49-2094	Electrical and Electronics Repairers, Commercial and...	48	$31.10	Associate degree
17-3013	Mechanical Drafters	47	$23.43	Postsec. Nondegree
51-4111	Tool and Die Makers	46	$22.92	Associate degree
19-4099	Life, Physical, and Social Science Technicians, All Other	42	$22.33	Associate degree
17-3029	Engineering Technologists and Technicians, Except...	41	$22.71	Some college
17-3022	Civil Engineering Technologists and Technicians	39	$29.48	Associate degree
19-4031	Chemical Technicians	30	$26.97	Associate degree
51-9162	Computer Numerically Controlled Tool Programmers	30	$28.74	Postsec. Nondegree
17-3012	Electrical and Electronics Drafters	26	$14.71	Some college
17-3024	Electro-Mechanical and Mechatronics Technologists...	25	$28.57	Postsec. Nondegree
53-3032	Heavy and Tractor-Trailer Truck Drivers	25	$29.70	Associate degree
19-4042	Environmental Science and Protection Technicians...	20	$28.07	Associate degree
43-4161	HR Assistants, Except Payroll and Timekeeping	17	$29.15	Associate degree
49-2011	Computer, Automated Teller, & Office Machine...	15	$23.83	Associate degree
17-3021	Aerospace Engineering and Operations Technologists...	13	$28.68	Postsec. Nondegree
17-3028	Calibration Technologists and Technicians	11	$30.07	Associate degree
49-9021	Heating, Air Conditioning, & Refrigeration Mechanics...	11	$31.10	Associate degree
43-4151	Order Clerks	<10	$23.43	Postsec. Nondegree
	Total jobs in top 25 occupations	**1,455**	**$27.56**	

Source: Lightcast

For bachelor's or advanced positions, most jobs in Smart Systems are for software developers, operations managers, engineers, and analysts. A bachelor's degree is the most in-demand level of educational attainment.

Top 25 Smart Systems occupations with high-level educational requirements of bachelor's and above with median hourly earnings, 2021

SOC Code	SOC Description	No. of Jobs (2021)	Median Hourly Earnings (2021)	Typical Entry Level Edu. Req. (2021)
15-1252	Software Developers	688	$49.19	Bachelor's degree
11-1021	General and Operations Managers	529	$46.17	Bachelor's degree
17-2051	Civil Engineers	482	$40.09	Bachelor's degree
17-2112	Industrial Engineers	374	$39.81	Bachelor's degree
17-2141	Mechanical Engineers	315	$46.17	Bachelor's degree
13-1082	Project Management Specialists	313	$44.21	Bachelor's degree
15-1211	Computer Systems Analysts	269	$47.27	Bachelor's degree
17-2071	Electrical Engineers	253	$47.63	Bachelor's degree
13-2011	Accountants and Auditors	213	$36.74	Bachelor's degree
11-9041	Architectural and Engineering Managers	196	$77.25	Bachelor's degree
13-1161	Market Research Analysts and Marketing Specialists	171	$31.31	Bachelor's degree
11-3021	Computer and Information Systems Managers	171	$69.51	Bachelor's degree
15-1244	Network and Computer Systems Administrators	164	$37.78	Bachelor's degree
13-1028	Buyers and Purchasing Agents	159	$30.41	Bachelor's degree
17-2199	Engineers, All Other	141	$48.54	Bachelor's degree
15-1251	Computer Programmers	130	$38.44	Bachelor's degree
13-1071	Human Resources Specialists	102	$30.40	Bachelor's degree
11-3051	Industrial Production Managers	96	$58.32	Bachelor's degree
13-1199	Business Operations Specialists, All Other	94	$35.76	Bachelor's degree
13-1111	Management Analysts	89	$38.16	Bachelor's degree
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	87	$42.81	Bachelor's degree
13-1151	Training and Development Specialists	81	$29.54	Bachelor's degree
11-3031	Financial Managers	79	$66.48	Bachelor's degree
17-2081	Environmental Engineers	77	$37.88	Bachelor's degree
15-1253	Software Quality Assurance Analysts and Testers	76	$37.30	Bachelor's degree
	Total jobs in top 25 occupations	**5,350**	**$44.29**	

Source: Lightcast

Manufacturing firms, as shown in tables in the previous pages, require diverse occupations to fill jobs in Electronics Manufacturing, Metal Products Manufacturing, Professional/Technical Services, and Data Center. The gap analysis below shows that Central New York underproduces Certificate-level and Associate's graduates in manufacturing and computer occupations but generally produces adequate Bachelor's-level graduates (if the region is able to retain sufficient graduates).

The table below shows occupation groups that are matched to degree programs to determine if the supply of graduates is sufficient to meet demand (measured as job openings in a year). A US comparison helps clarify if there is a gap or overproduction of graduates by comparing regional graduates to jobs with the US ratio of graduates to jobs (as shown in the right column below).

Certificate-level programs either underproduce locally or not available at all. **Machinists** are under-produced with just 2 graduates. **Industrial Production Technicians** and **Industrial Machinery Maintenance** have no graduates to serve the 300+ annual job openings. **Computer Support**

Supply-Demand Gap Conditions
Smart Systems, Central New York

Gap	Occupation Group	Avg. Educ. Level	Regional 2021 Job Openings	Graduates	Regional Ratio	Supply-demand Ratio versus US
	General Machinist	Certificate	164	2	1%	11%
	Electrical & Electronics Repairers	Certificate	82	32	39%	90%
	Computer Installers & Repairers	Certificate	22	0	0%	0%
	Industrial Production Technicians	Certificate	147	0	0%	0%
	Industrial Machinery Maintenance	Certificate	131	0	0%	0%
	Industrial Engineering Technicians	Associate's	32	20	63%	66%
	Mechanical Engineering Technicians	Associate's	16	33	206%	83%
	Computer Support Specialists	Associate's	124	71	57%	64%
	Electrical / Electronics Technicians & Di	Associate's	43	34	79%	293%
	Computer Hardware Engineers	Bachelor's	4	83	2075%	921%
	Mechanical Engineers	Bachelor's	79	109	138%	81%
	Computer Systems & Information Secui	Bachelor's	130	724	557%	614%
	Operations Research Analysts	Bachelor's	10	0	0%	0%
	Electrical and Electronics Engineers	Bachelor's	65	70	108%	86%
	Civil Engineers	Bachelor's	73	52	71%	75%
	Executives & Management Analysts	Bachelor's	992	1,426	144%	223%
	Engineering Managers	Bachelor's	35	0	0%	0%
	Accountants & Tax Examiners	Bachelor's	256	321	125%	259%
	Industrial Engineers	Bachelor's	76	25	33%	45%

Source:
EY analysis of data from Lightcast and US Dept. of Education

Lg Shortage | Shortage | In-Balance | Over-Supply | Lg Over-Supply

programs at the Associate's level underproduce. On a positive note, **Electronic Repair** graduates are in-balance with demand relative to US levels.

Bachelor's level programs are either in-balance or overproducing graduates potentially. Large numbers of graduates (relative to the US) are produced in **Computer, Electrical,** and **Mechanical Engineering**, as well as **Business** and **Accounting**. **Industrial Engineering** and **Civil Engineering** programs are likely underproducing graduates to meet local demand.

More on the Methodology

"Job openings" in 2021 is used to determine demand, which is a combination of workforce turnover and retirement as well as net new jobs. Regional job openings are compared to regional graduate output using an SOC-CIP taxonomy that accounts for education levels. (For example, a Bachelor's in Psychology is not matched with a Psychologist occupation because a Master's or PhD is required.)

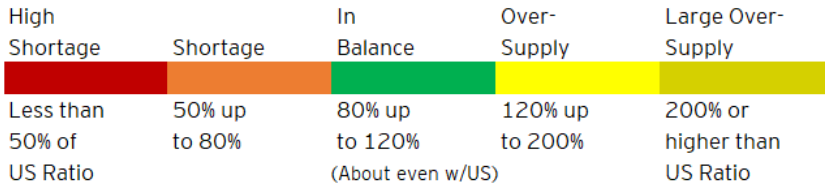
Furthermore, the "supply-demand gap" doesn't hold true as a 1:1 ratio for all occupations. Therefore, we compare the regional ratio to the US ratio to determine if regional graduate output is relatively high or low. This Regional-to-US ratio also compensates for "non-accredited" programs that may exist but aren't in the data (e.g. for-profits that aren't required to report their enrollment data to the government). For example, non-profits may train Home Health Aides which aren't in the data, but the regional comparison of "accredited" graduates to the US does help inform if a local gap may exist.

We determine the regional gap or oversupply in the right column ("ratio vs. US"). If regional graduate output is less than 50% of the US ratio, then we determine there is a large shortage and color the first "Gap" column a dark red. See the legend for colors and their ranges below.

Why does graduate output not always match job openings evenly? Graduates sometimes choose other occupations: Welding may need more graduates since many may finish the program and then choose other jobs, or an Electrical Engineering graduate with a minor in Business may choose a sales but not engineering job. Some positions, like Executive Secretaries or Logistics Clerks are helped by Certificates but many workers learn their skill on the job.

Data is sourced from US Dept. of Education's IPEDS programs (graduate output) and Lightcast/EMSI (job openings by occupation by county). We use a custom taxonomy allocates 1,000 occupation codes and 10,000 graduate program codes (CIP+AwardLevel combinations) into 310 occupation groups. Some degree programs aren't matched if they don't align with jobs in the SOC system or if more education is needed to enter the occupation.

Gap Legend and Ratio Ranges:



Educational programming

About

The educational chapter explores the overall educational attainment levels within the region, the typical entry-level educational attainment requirements by target sector, and the educational pipeline for the region. With this analysis, we seek to understand the talent supply within the region and the opportunity for employment within a target sector at various educational attainment levels. Key metrics in this chapter include:

- Educational attainment levels
- Degree production by award type
- Enrollment by level and full-time status
- Type of certificate production
- Jobs by typical entry-level educational requirement by target sector

Key findings

- The adult population of Central New York trails state educational attainment levels, but Bachelor's and Advanced degree attainment is increasing.
- Over 80% of all postsecondary credentials produced in Central New York are at the bachelor's level or higher.
- Business programs produce the most graduates, followed by Health and Education. Health Professions offer the most diverse degree award options. Large numbers of IT Master's are produced (650).
- Registered apprentices have more than tripled in Central New York since 2016 and programs accepted more than 1,600 new students in 2021. Registered apprentices have more than tripled in Central New York since 2016 and programs accepted more than 1,600 new students in 2021.

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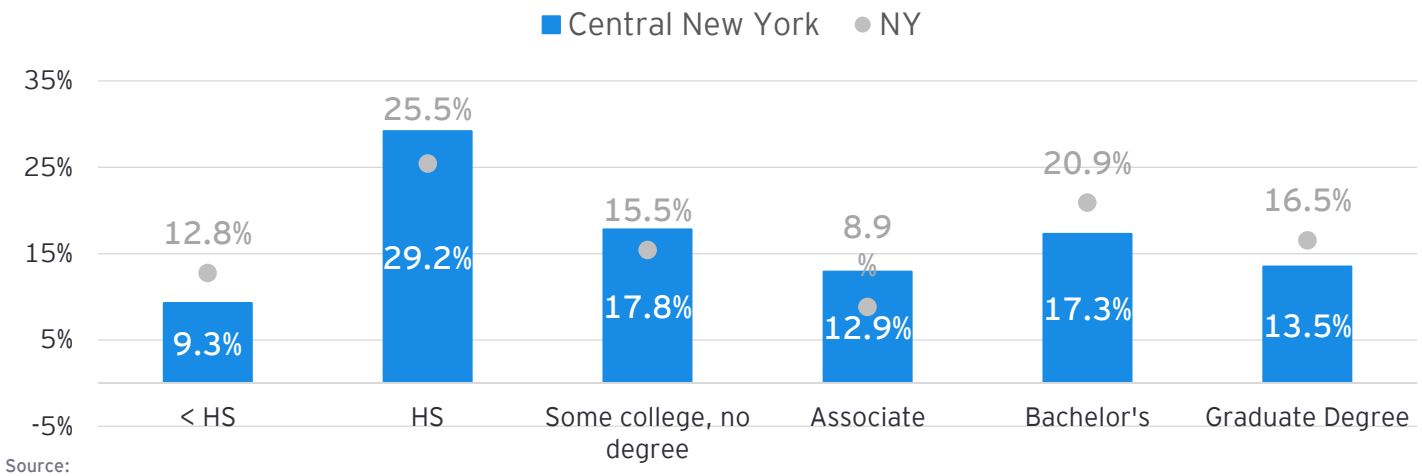
The population in Central New York tends to have lower educational attainment compared to the state averages.

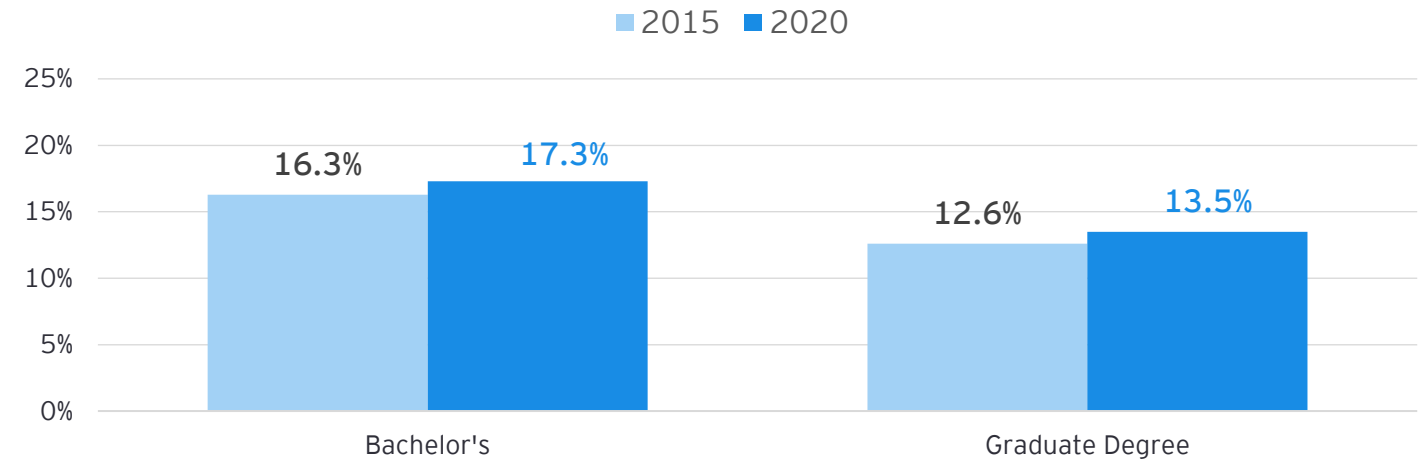
Educational attainment of population age 25 and older, 2021*



Source:
US Census Bureau

The bachelor's+ educational attainment of Central New York's adult population has improved slightly over the past five years.

Educational attainment for population age 25 and older, 2015 vs. 2021



Source:
US Census Bureau

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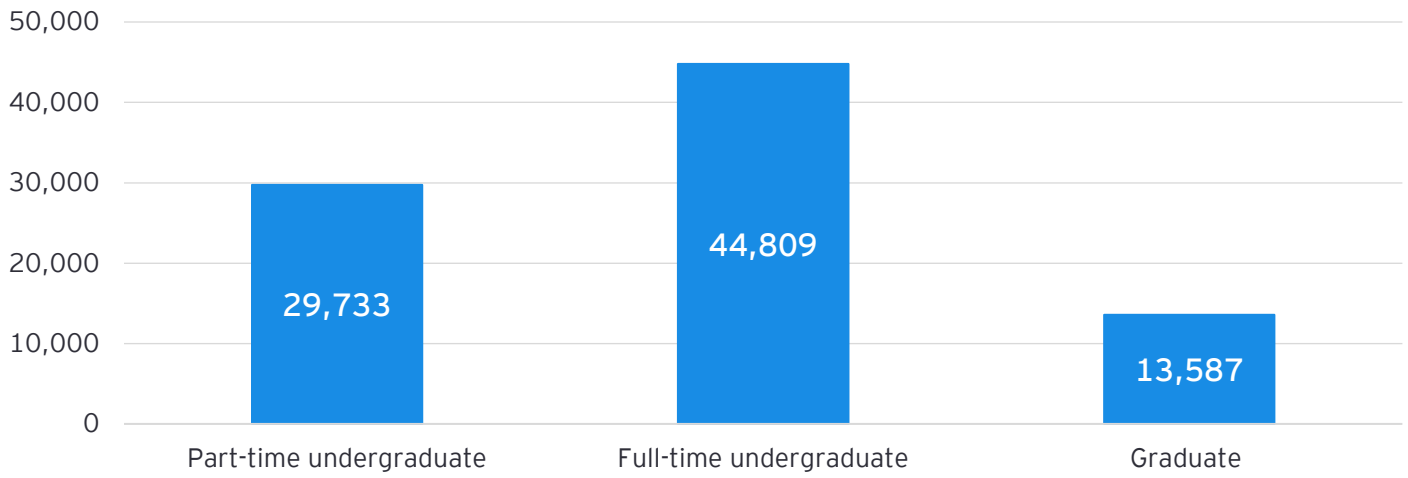
Most of the 88,000 postsecondary students enrolled in Central New York institutions are full-time undergraduates.

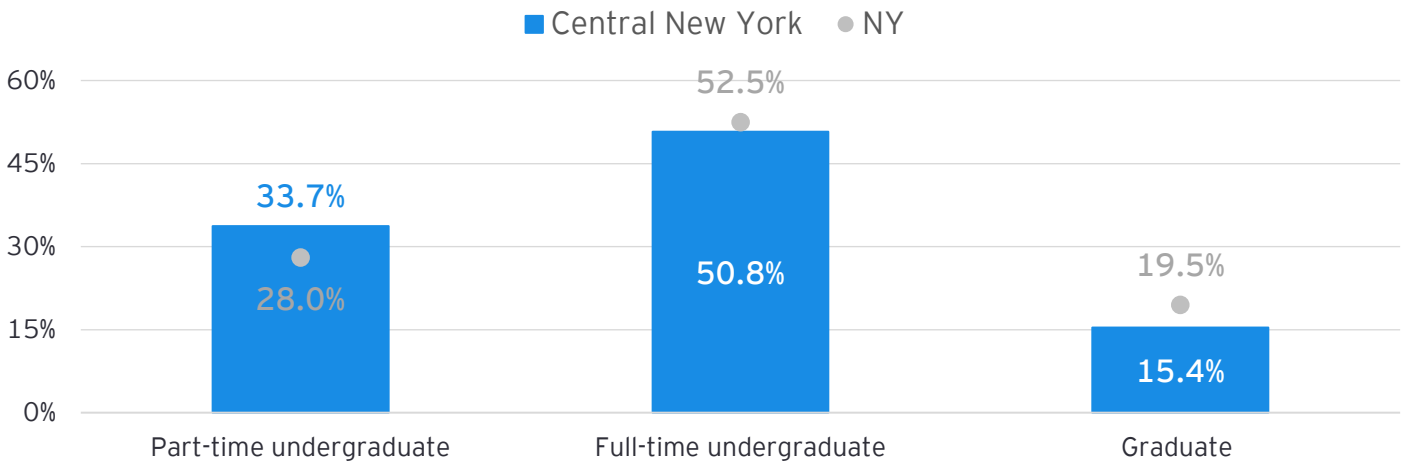
Enrollment in higher education institutions by level 2020 – 2021 academic year



Source:
National Science Foundation, IPEDS Survey

Central New York has a higher share of postsecondary, part-time undergraduates than seen statewide.

Share of enrollment in higher education institutions by level 2020 – 2021 academic year



Source:
National Science Foundation, IPEDS Survey

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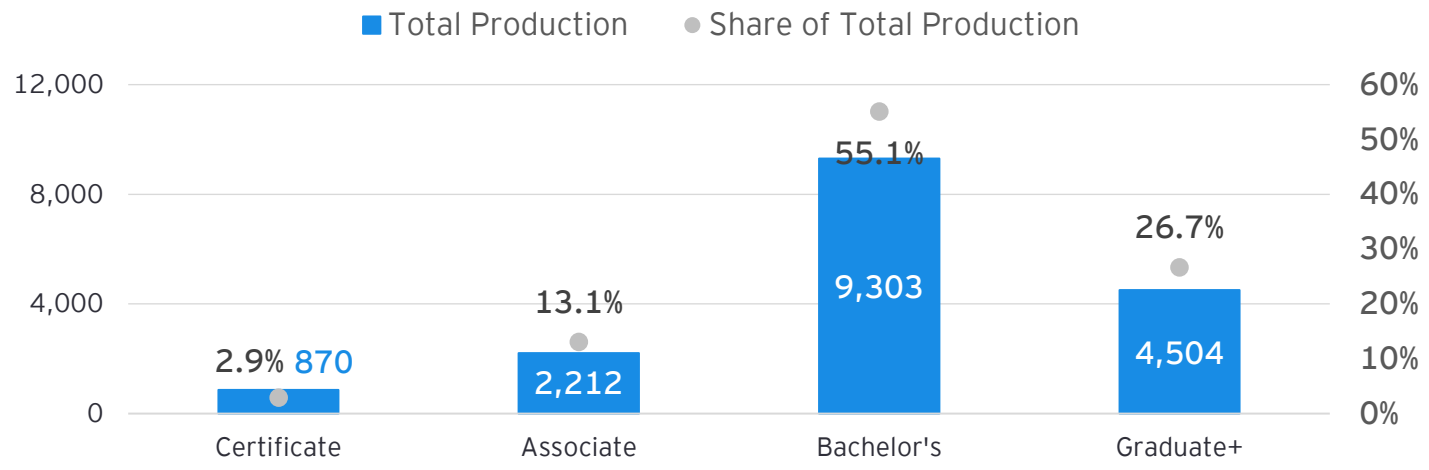
Over 80% of all postsecondary credentials produced in Central New York are at the bachelor's level or higher.

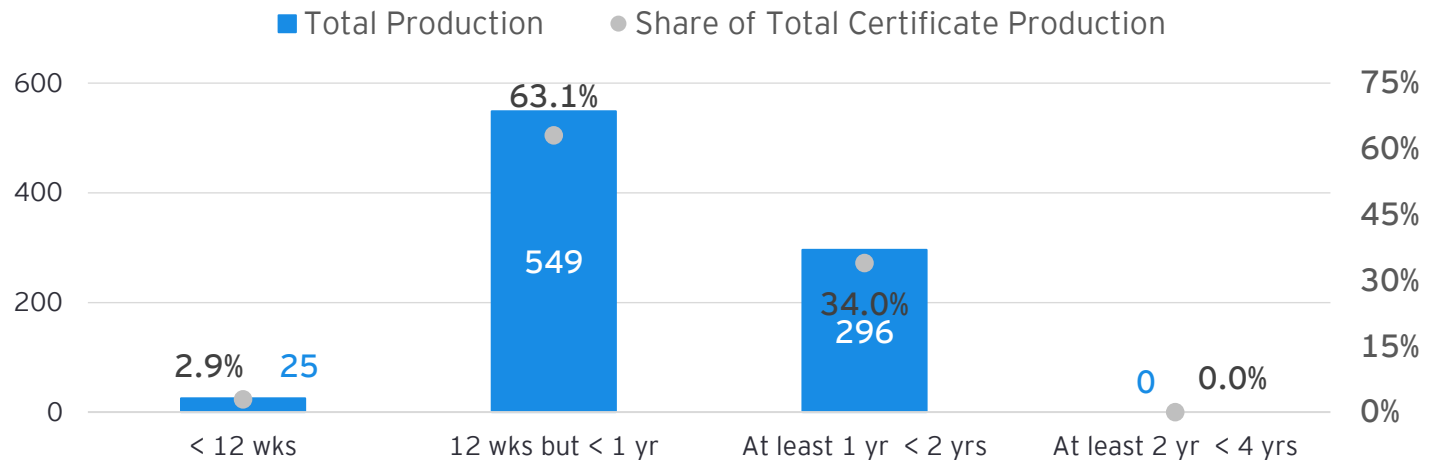
Degree production 2020 – 2021 academic year



Source:
National Science Foundation, IPEDS Survey

Accredited certificate production is highest for at least 12 weeks but less than 1-year programs. Relatively few shorter-term certificates are produced.

Certificate production 2020 – 2021 academic year



Source:
~~US Bureau of Labor Statistics~~ NSF HERD

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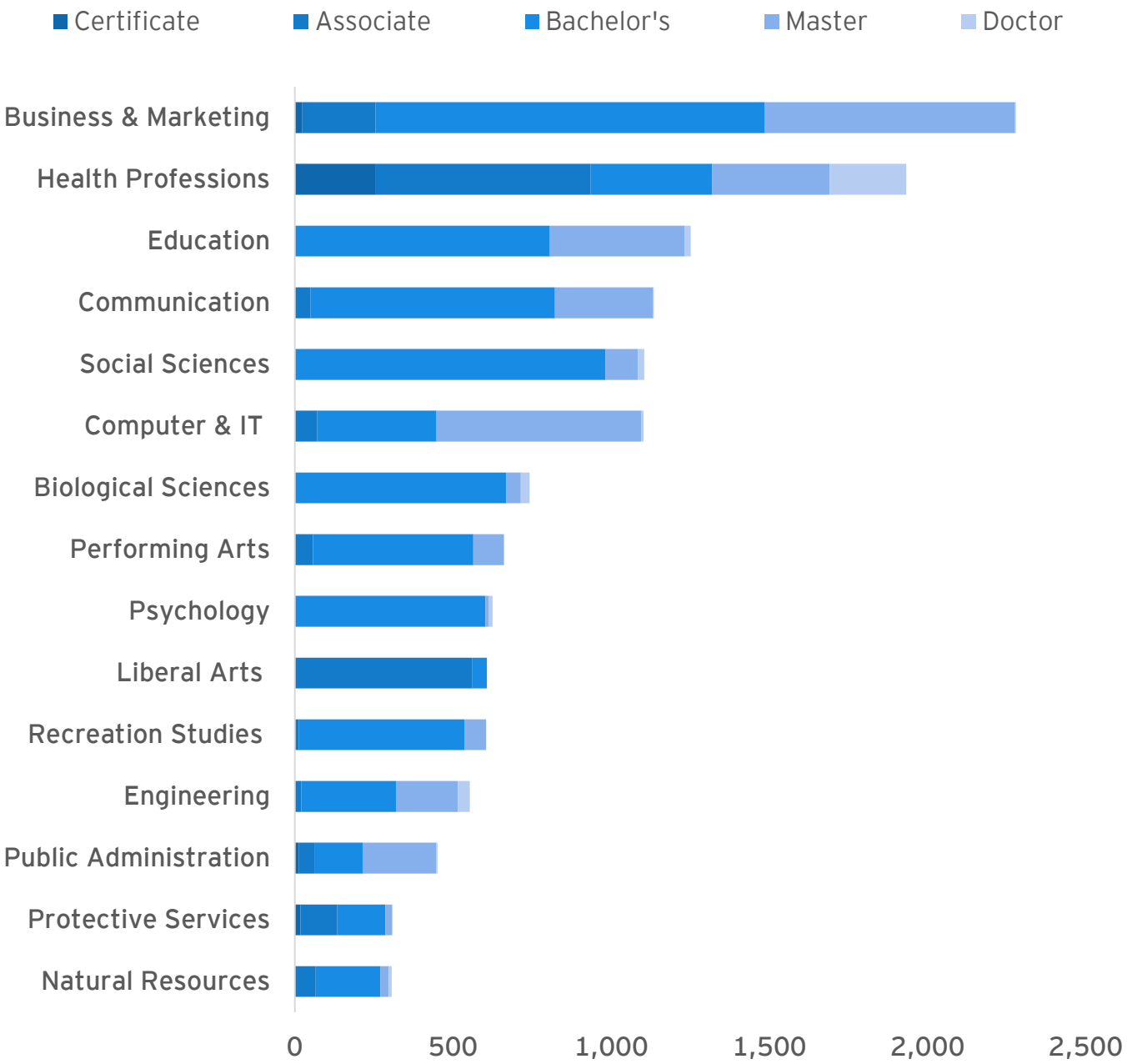
Business programs produce the most graduates, followed by Health and Education. Health Professions offer the most diverse degree award options. Large numbers of IT Master's are produced (650).

Top 15 degrees by award level by CIP, 2020-2021 academic year



Source:
National Science Foundation, IPEDS Survey

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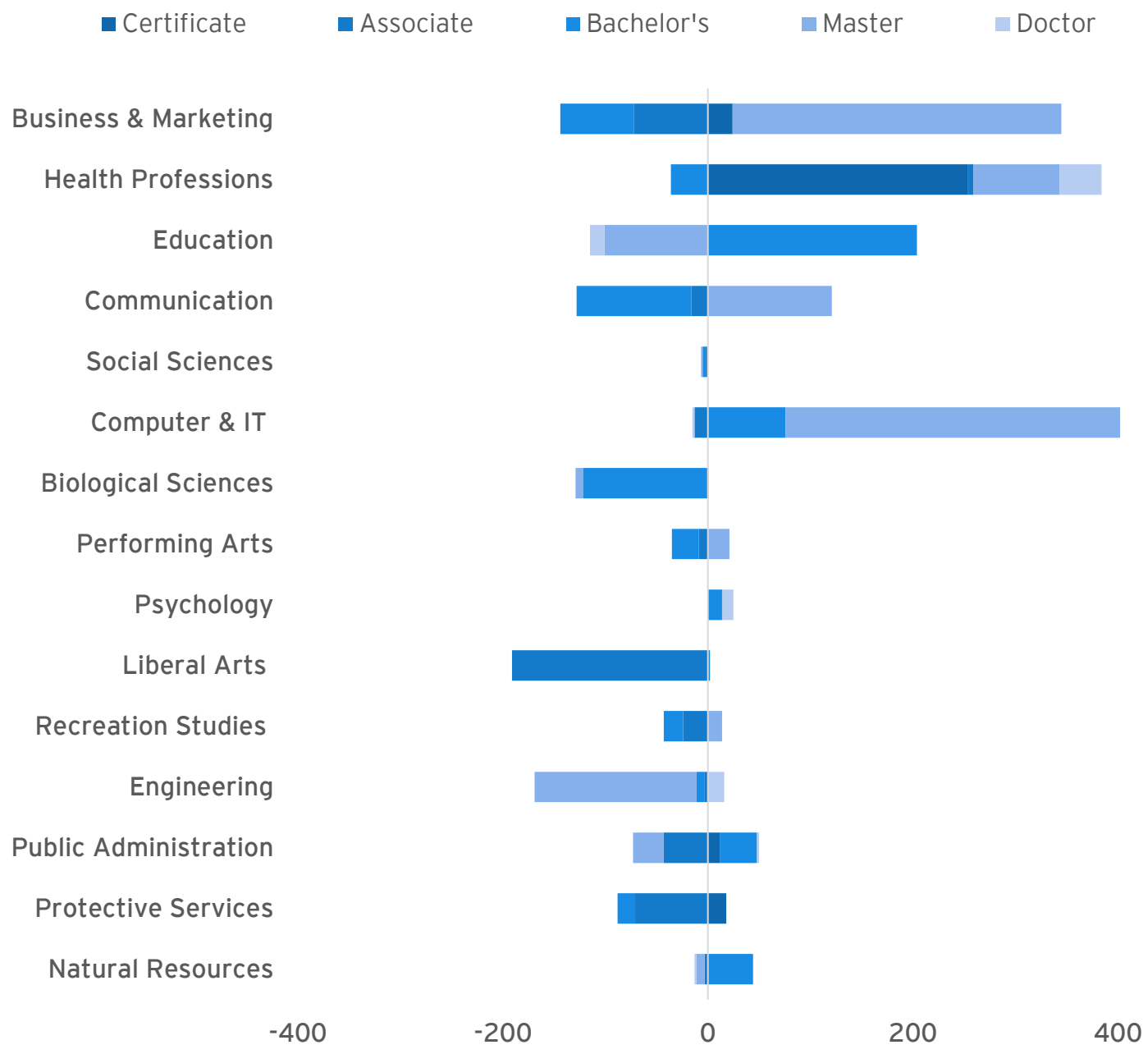
Computer Master's graduates increased the most over the last five years, followed by Business Master's and Health (at all levels). Liberal Arts Associate's and Engineering Master's fell the most (possibly due to a reclassification into IT).

Change in top 15 degrees by award level by CIP, 2015-2016 to 2020-2021 academic year



Source:
National Science Foundation, IPEDS Survey

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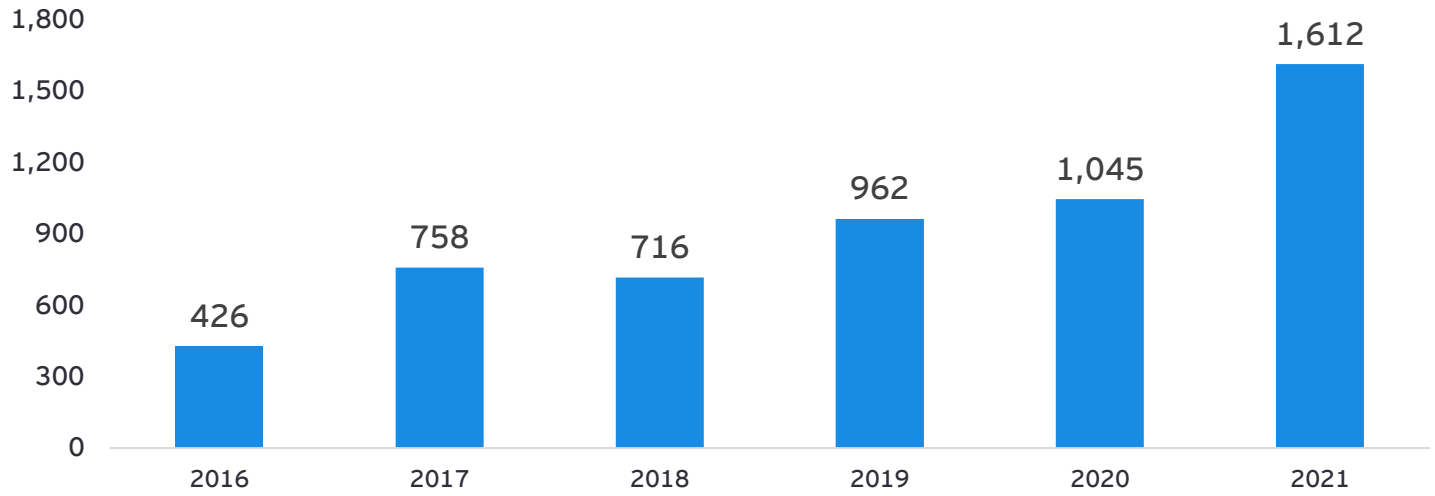
Registered apprentices have more than tripled in Central New York since 2016 and programs accepted more than 1,600 new students in 2021. Year-over-year growth in programs since 2020 is high and no downturn occurred during 2020.

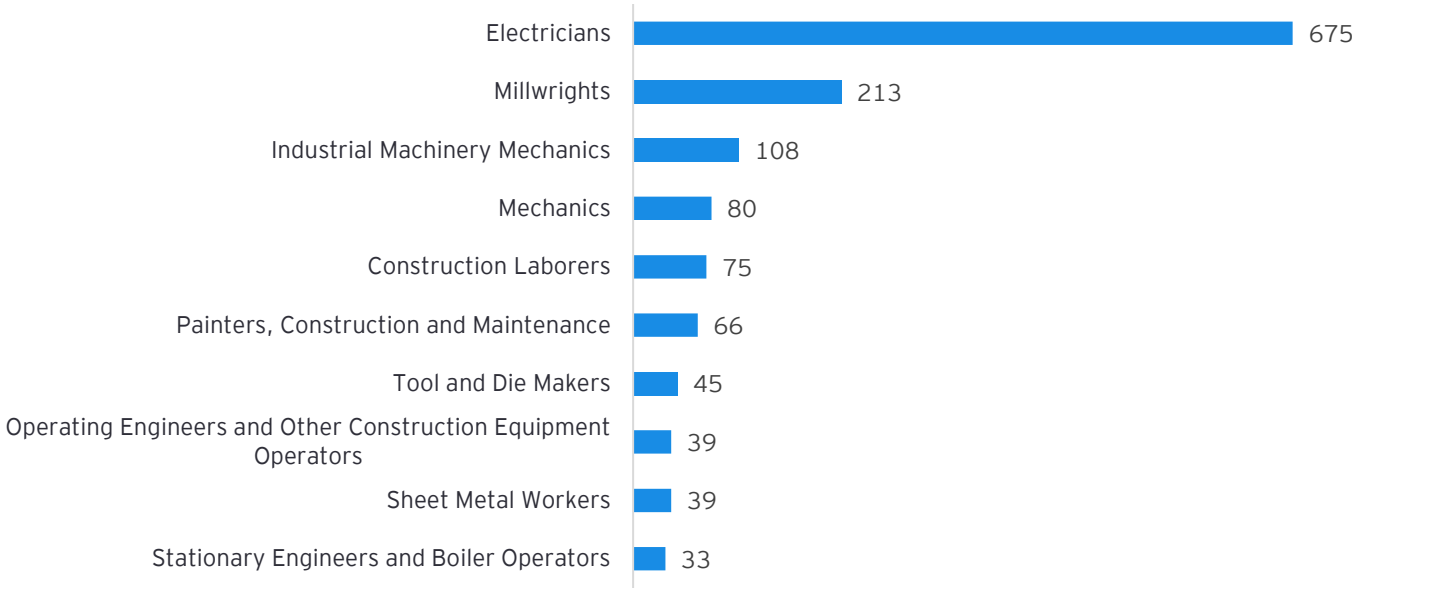
New Registered Apprentices in Central, 2016-2021



Source:
DOL RAPIDS

Electrician programs receive the most new apprentices each year followed by Millwrights and Industrial Machinery Mechanics.

Registered Apprentices by Occupation in Central, 2021



Source:
DOL RAPIDS

Sources

Data sources used as part of the research a

Population and components of population
US Census Bureau, Population Estimates

Population by race
US Census Bureau, ACS 5-year estimates

Population by age cohort
US Census Bureau, ACS 5-year estimates

Unemployment rate
Bureau of Labor Statistics, LAUS

Labor force
US Bureau of Labor Statistics, QCEW
Bureau of Labor Statistics, LAUS

Foreign-born population
US Census Bureau, ACS 5-year estimates

Non-Citizen population
US Census Bureau, ACS 5-year estimates

Language other than English
US Census Bureau, ACS 5-year estimates

Modes of transportation and commute times
US Census Bureau, ACS 5-year estimates

Poverty rate
US Census Bureau, ACS 5-year estimates

Population with disability
US Census Bureau, ACS 5-year estimates

Civilian labor force participation rate 16+ years
US Census Bureau, ACS 5-year estimates

Unemployment rate 16+ years
US Census Bureau, ACS 5-year estimates

Labor force by age, race/ethnicity, and education
US Census Bureau, ACS 5-year estimates

Unemployment rate by age, race/ethnicity, and education
US Census Bureau, ACS 5-year estimates

Talent inflow/outflow
US Census Bureau, OnTheMap

Resident worker migration
Lightcast

Employment
US Census Bureau, ACS 5-year estimates
US Bureau of Labor Statistics, QCEW
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Top industries by employment
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Employment by industry
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Number of payrolled business locations
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Average annual earnings by industry
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Typical entry-level education by industry
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Sector employment by age and sex
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Educational attainment of residents aged 25 and older
US Census Bureau, ACS 5-year estimates

Enrollment in higher education
National Science Foundation, IPEDS Survey

Post-secondary degree production
National Science Foundation, IPEDS Survey

Degree production by award level and CIP
National Science Foundation, IPEDS Survey

Apprenticeships data
US Department of Labor, RAPIDS

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